Mammoth Creek
Forest Stewardship Plan

# Appendix N - Bird and Bat Box Specifications

Mountains Southwest Plains

Research Note RM-381

January 1980

USDA Forest Service
Rocky Mountain Forest and
Range Experiment Station

# Constructing Wooden Boxes for Cavity-Nesting Birds

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Construction details for two sizes of nest boxes are described. In field trials, eight species of cavity-nesting birds nested in the smaller boxes and five species, in addition to red squirrels, raised young in the larger nest boxes.

**Keywords:** cavity-nesting birds, nest boxes, birdhouses

### Management Implications

Nest boxes will never replace natural cavities found in live trees and snags. However, when few or no trees with natural cavities are available, nest boxes can help meet cavity requirements and help maintain diversity and populations of cavity-nesting birds.

## Introduction

The scarcity of nesting and roosting cavities is a major factor limiting the populations and diversity of primary cavity-nesting birds (woodpeckers) and secondary cavity-nesting birds (those using old woodpecker holes).[2] An average of two or three nesting trees per acre is needed to maintain diversity and populations of secondary cavity-nesting birds in southwestern ponderosa pine (*Pinus ponderosa*) forests (Balda 1975, Scott 1978) (fig. 1). Past commercial timber harvesting practices and increasing demand for fuelwood in national forests of the central Rocky Mountains, especially along the Front Range in Colorado, have reduced the number of nesting trees (American Forests 1979).

When nesting trees are scarce, nest boxes can supplement or substitute for natural nest cavities. Studies by Hamerstrom et al. (1973) with American kestrels (*Falco sparverius*), and Zeleny (1973) with eastern bluebirds (*Sialia sialis*) demonstrated an increase in breeding when suitable boxes were provided. Bruns (1960) and Franz (1961) cite several European works that document a fivefold to tenfold increase of insectivorous cavity-nesting birds after nest boxes were introduced.

This note describes construction of two sizes of wooden nest boxes and their use by birds and mammals in Colorado Front Range ponderosa pine forests. Design of the boxes was adapted from various features of existing box plans (Sawyer 1955, Peterson 1963, U.S. Department of Interior 1969, and Zeleny 1977) (table 1).

## Nest Box Design and Placement

Entry hole sizes shown in table 1 restrict use to selected species or similar-sized birds. Starlings (*Sturnus vulgaris*), for example, cannot enter boxes with holes smaller than 1-1/2 inch in diameter. Entry holes 3 inches in diameter are recommended for common flickers (*Colaptes auratus*), for example, but this size hole does not prevent use by smaller species, such as mountain bluebirds (*Sialia currucoides*).

Nest boxes should be placed on posts or trees and secured with nails or wire. Boxes generally should face the nearest trees, shrubs, fences, etc., so that birds on their first flight may reach a perch high enough to provide protection against predators. Boxes in trees should be in the more open areas within the crown so birds can easily find them.

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[2] Beebe, Spencer B. 1974. Relationships between insectivorous hole-nesting birds and forest management. Unpublished manuscript, 49 p. Yale University, School of Forestry and Environmental Studies, New Haven, Conn.

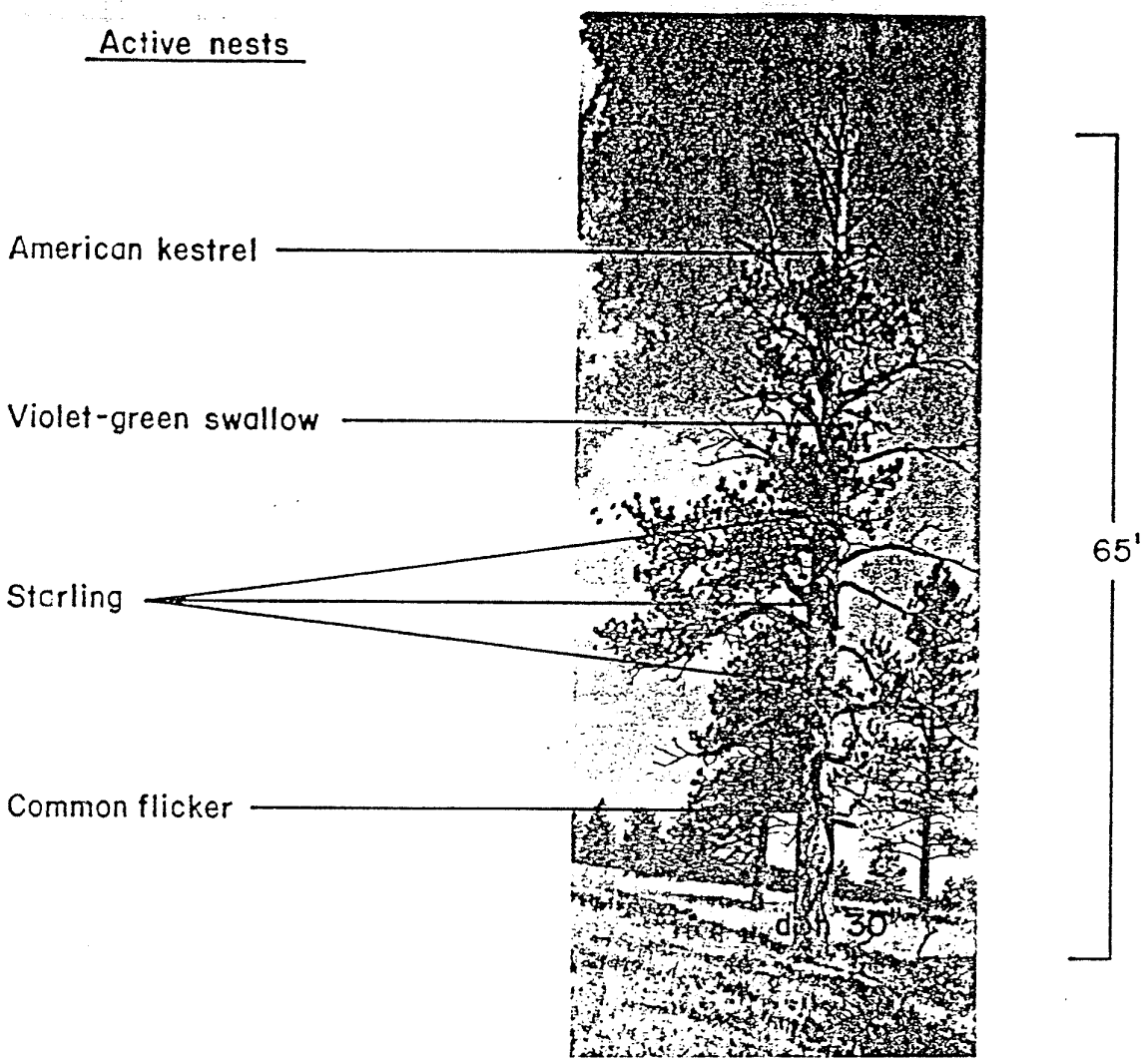


**Figure 1.—High quality nesting trees are rapidly disappearing from accessible areas along the Front Range in Colorado.**

Boxes to accommodate western bluebirds (*Sialia mexicana*) should be placed along forest edges or in grassy glades within open forests. Kestrels prefer to nest in open areas because of their hunting habits. Boxes should be accessible from the ground or by ladder to allow inspection, cleaning, and minor repairs.

Nesting material should not be provided in the small-floor-size box (table 1) since most species using these boxes build their own nests. The large-floor-size nest box (table 1), intended for larger species which do not build nests, should have 1/2 to 1 inch of wood shavings. Old nests should be removed and boxes cleaned each fall to reduce fouling and parasites.

Two to four small nest boxes per acre are recommended. This density will prevent most intraspecies and interspecies conflicts for territorial right (Sawyer 1955). One large nest box per 10 acres is recommended if the objective is to attract the larger, less common birds, such as American kestrel, flammulated owls (*Otus flammeolus*), and saw-whet owls (*Aegolius acadicus*). These species are generally less affected by removal of nesting trees (Balda 1975).

Some nest boxes are never used by resident birds, perhaps because plentiful natural nesting sites are available elsewhere, boxes are not found, entrance holes are too small, boxes are placed too high or low, predators are present, or construction is faulty. However, western and mountain bluebirds were found to accept large nest boxes with 3-inch entry holes at locations 20 feet above ground when there were no other nesting sites. Kind, size, and placement of nest boxes should be based on nest requirements of specific species. A nest box not used its first season may be used the next year.

## Nest Box Construction

Two nest boxes, designated small and large, were designed as acceptable, durable, and relatively inexpensive substitutes for natural cavities.

Table 1.—Dimensions (inches) and placement of nest boxes acceptable by selected cavity-nesting birds in the Front Range in Colorado (adapted from Sawyer 1955, Peterson 1963, and U.S. Department of the Interior 1969)

| Species | Floor size | Box depth | Entry hole diameter | Feet above ground |
|---|---|---|---|---|
| Mountain chickadee (*Parus gambeli*) | [1]4x5-1/2 | 6 to 8 | 1-1/8 | 5 to 10 |
| House wren (*Troglodytes aedon*) | " | " | 1-1/4 | " |
| Violet-green swallow (*Tachycineta thalassina*) | " | " | 1-1/2 | " |
| Tree swallow (*Iridoprocne bicolor*) | " | " | " | " |
| Downy woodpecker (*Dendrocopos pubescens*) | " | 8 to 10 | 1-1/4 | " |
| Pygmy nuthatch (*Sitta pygmaea*) | " | " | " | " |
| Red-breasted nuthatch (*Sitta canadensis*) | " | " | " | " |
| White-breasted nuthatch (*Sitta carolinensis*) | " | " | 1-1/2 | " |
| Western bluebird (*Sialia mexicana*) | " | " | " | " |
| Mountain bluebird (*Sialia currucoides*) | " | " | " | " |
| Hairy woodpecker (*Dendrocopos villosus*) | [2]6x7-1/2 | 12 to 16 | " | 10 to 25 |
| Saw-whet owl (*Aegolius acadicus*) | " | " | 2-1/2 | " |
| Common flicker (*Colaptes auratus*) | " | " | 3 | " |
| American kestrel (*Falco sparverius*) | " | " | " | " |
| Common screech owl (*Otus asio*) | " | " | " | " |

[1]*Standard 1- by 6-inch boards for floor and walls, actual size variable from board to board.*
[2]*Standard 1- by 8-inch boards for floor and walls, actual size variable from board to board.*

Both boxes can be constructed from 1-inch redwood or pine. Lumber grades no. 2 and no. 3 planed or rough one side are suitable. Drilled pilot holes for nails are necessary if splitting is a problem. Loose knots and minor splitting can be patched with small blocks of wood or sheet metal. The wood should weather naturally to blend with surrounding vegetation.

Materials and dimensions for the nest box sizes are shown in table 2. Variable board widths are satisfactory if all box components are cut from the same board. Depending on condition of the lumber and expected waste, length of box wall components in table 2 can be shortened 1 inch to fit various standard board lengths. For example, shortened wall, bottom, and lid components for a large nest box can be cut from an 8-foot-long board, or for two small boxes from a 10-foot-long board.

Box components are most easily cut with a table saw (for bevel cuts), radial arm saw (for straight and angle cuts), and a drill press (circle cutter for entry holes.) The 1-1/2- and 3-inch-diameter entry holes are centered 2 and 3 inches below the top of the front wall of the small and large boxes, respectively. An electric hand drill fitted with a high-speed 1-1/2-inch-diameter wood bit or hole cutter can be used to make the small entry hole.

Boxes can be assembled with simple hand tools after components are cut and entry holes made (fig. 2). Assembly of the small box is similar.

A few preconstruction tasks should be completed before assembly. A pencil line is drawn about 4 inches down from one end of the back board (fig. 2A). The line is needed to position the sides at the top of the box. Next, drill 1/8-inch-diameter holes about 1-1/2 inches down and in from the edge on each end of the back board (fig. 2A). A third hole is also drilled between the holes at each end of the back board. These holes are used to attach the box to a tree or fencepost. Two or three vents and/or lighting holes (3/8- to 1/2-inch diameter) should be drilled about 1 inch below the top of both side boards (fig. 2A). The final preconstruction task is to scratch or roughen the inside of the box front with a wood chisel or saw (fig. 2B). The roughened surface serves as an escape ladder for fledglings. A strip of hardware cloth stapled to the inside front serves the same purpose. In the large nest box, a small block of wood (2 by 2 by 2 inches) nailed halfway down on the inside front board will serve as a ladder and inside perch.

Illustrated step-by-step construction is presented in figure 2. First, attach the sides to the back board. Place the long edge of each side, in turn, flush with the pencil line, align with the edge of the back board, and nail using three to five sixpenny box nails (fig. 2A).

The bevel on the box front is then aligned with the slope of the sides (fig. 2C). One nail is set on each side near the top. This makes it possible to apply leverage to align

Table 2. Materials and approximate dimensions of components for small and large nest boxes

| Materials | Small box | Large box |
|---|---|---|
| | - - *(inches)* - - | |
| Lumber for box (standard dimension) | 1x6x62 | 1x8x96 |
| Front (length)[1] | 10 | 17 |
| Back (length) | 17 | 24 |
| Sides, cut on diagonal (total length) | 20-1/2 | 34 |
| Long edge | 11 | 18 |
| Short edge | 9-1/2 | 16 |
| Lid[2] | 10 | 13 |
| Bottom[3] | 4-1/8 | 5-7/8 |
| Lumber for lid cleats (1- by 2-inch board) | 9 | 19-1/2 |
| Lid holding cleat (length)[4] | 5-1/2 | 7-1/4 |
| Lid under cleat (length) | 3-1/2 | 5 |
| Lid outside cleat (length) | — | 7-1/4 |
| Hardware | - - *Amount* - - | |
| Nails (sixpenny box) | 18-20 | 26-30 |
| Round-head stove bolts, nuts (3/16 inch) | | |
| For lid hinge (1 inch long) | 4 | 4 |
| For lid holding cleat (2 inches long) | 2 | 2 |
| Washers (3/16 inch) | 8 | 8 |
| Loose pin butt hinge (2 inches) | 1 | 1 |
| Screw eyes for latch (3/4 inch) | 2 | 2 |
| Galvanized wire for latch (12 gage) | 10 inches | 10 inches |
| Nail for latch (eightpenny box) | 1 | 1 |
| Double-headed nails to secure box on post or tree (sixteenpenny) | 4 | 6 |

*[1]15° bevel edge (suggested) top of front wall. Bore 1-1/2- or 3-inch entry holes for small and large boxes, respectively.*
*[2]15° bevel edge (suggested) for lid contact against back wall.*
*[3]Cut to fit inside box walls (exact size dependent on board width). Cut one-fourth-inch triangle from each corner for drainage holes.*
*[4]15° bevel edge (suggested) for contact with lid.*

ither side with the front. Three or four additional nails to ach side are adequate to secure the box front.

The box bottom should be carefully measured and awed for a snug fit (fig. 2D). Remove a one-fourth-inch riangle from each corner to allow drainage. Recess the ottom board about one-fourth-inch to prevent weathering and secure, using one or two nails on each side.

The lid is constructed by nailing two 1- by 2-inch cleats cut to size shown in table 2) to the underside of the lid oard (fig. 2E). The cleats minimize warping and plitting and prolong life of the box lid.

The lid-holding cleat is next attached to the box (fig. 2F). With the box lying on its back, position the lid on top of the box with the beveled edge against the back board. The beveled edge of the lid-holding cleat is then placed and held in contact with the lid and back board. Draw a pencil line against the upper edge of the cleat to mark this position. Remove the lid from the box and realign the lid-holding cleat with the pencil line and nail to the back board using small finishing nails or brads. Then drill two 3/16-inch holes 1-1/4 inches from each end of the cleat, and through the back board. Attach the cleat to the back board using 3/16- by 2-inch stove bolts, nuts, and washers, and remove excess length of bolts with a hack-saw or bolt cutter.

Many types of latches, fasteners, hinges, posts, pins, screws, etc. can be used to secure lids to nest boxes. A loose-pin butt hinge and wire fastener was used here to secure the removable lid. With the box on its back, position the lid under the lid-holding cleat and in contact with the box front. A space of about one-sixteenth inch should remain between the lid and box back (shimmed with a nail) to allow easier closing during wet weather. The butt hinge (with pin in place) is then centered above the entry hole and held in contact with the underside of the lid and box front (fig. 2G). Scribe the location of the holes in the hinge half against the box front with a pencil or awl. Scribe the position of two holes in the upper hinge half after attaching the bottom half of the hinge. Drill 3/16-inch holes at the scribed locations and attach the hinge using 3/16- by 1-inch stove bolts, nuts, and washers (fig. 2G). Remove and discard the loose pin holding the hinge halves together. Slight adjustments can be made by repositioning one side of the hinge if the hinge halves do not mesh smoothly. A metal cutting file may also be used to improve the mesh of the hinge halves.

The nest box lid is secured with a wire pin inserted through the hinge halves. The pin device is shown in figures 2H and I. The fastener is made from a straightened, 10-inch piece of 12-gage galvanized wire shaped and bent to an approximate right angle with about 3-1/2 inches on the side and a one-half inch square eye on one end. Two pairs of heavy-duty pliers for bending the wire and a wire cutter to remove excess wire are the only tools needed to make the fastener. A hammer and a hard metal surface may also be used to further straighten the finished fastener. Extra standard size fasteners should be made to replace any that are lost.

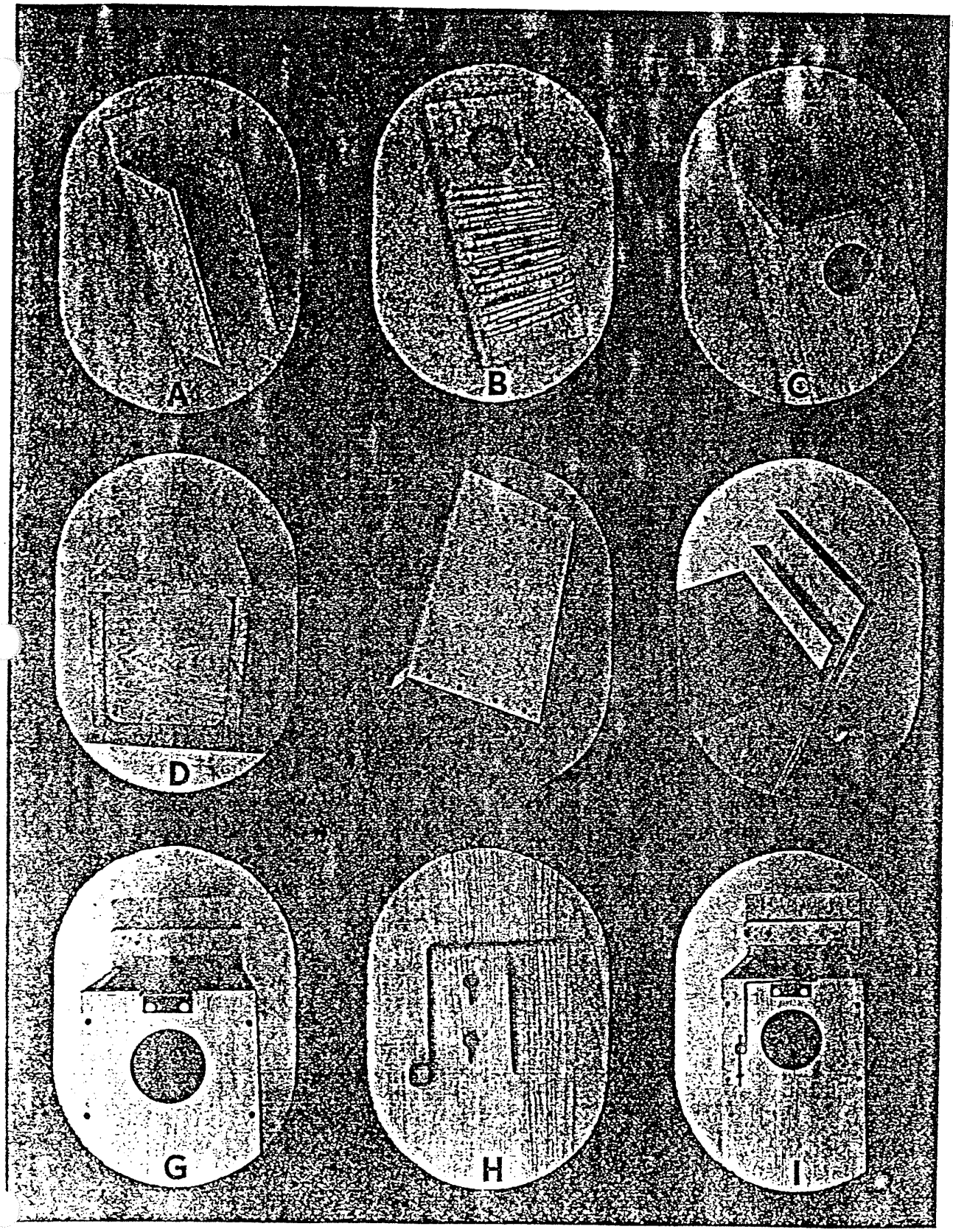


Figure 2.—Construction details for the large nest box.

With the fastener in place, either left or right side of the hinge, set the first screw eye about 1 inch from the edge of the front wall in the center of the square eye. Set the second screw eye about 1-1/2 inches directly below the first. Position both screweyes horizontally. Insert an eight-penny box nail from the top through the screw eyes to provide a lock for the fastener. Finished models of the small and large nest boxes are shown in figure 3.

## Use of Nest Boxes

Nest boxes placed in large open areas within the Colorado Front Range ponderosa pine forests most commonly attract western and mountain bluebirds (fig. 4). In a recently logged ponderosa pine stand with few natural cavities on the Manitou Experimental Forest about 30 miles northwest of Colorado Springs, Colo., 100 small nest boxes were placed 5 feet above ground at densities ranging from two to six boxes per acre. These nest boxes, made for bluebirds, were similar in dimensions to the small box, but had lids secured with

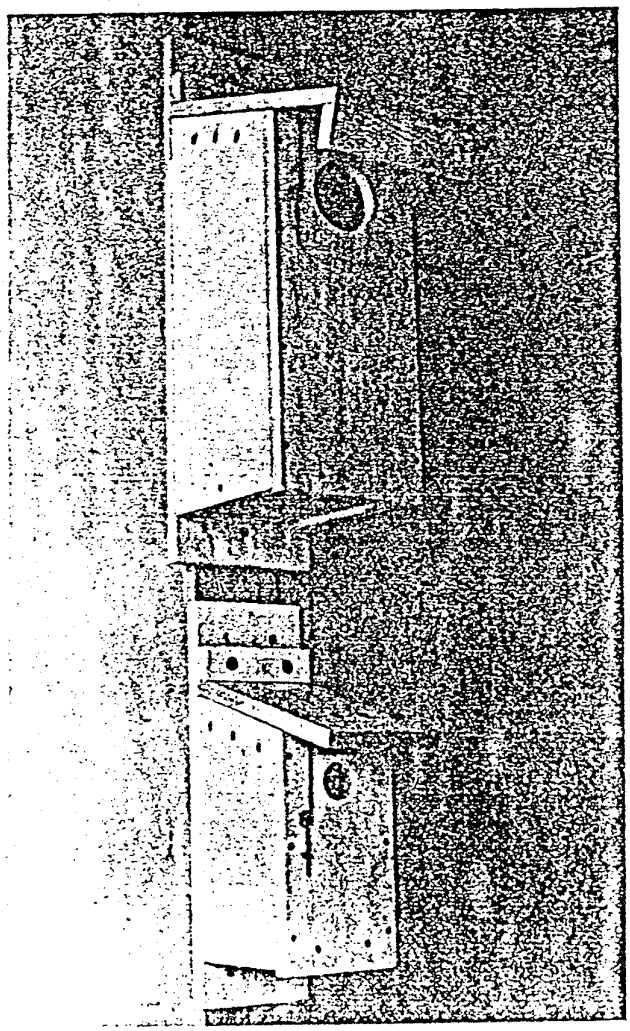

Figure 3.—Completed models of the small and large nest boxes.

Figure 4.—Small nest boxes in open ponderosa pine forests are commonly accepted by bluebirds.

screws. Box lids attached with loose-pin butt hinge and wire pin closures described in this note are much faster to remove and longer lasting than screw lid equipped boxes. During a 2-year period, the 100 boxes were used by 103 breeding pairs of cavity nesters.[3] The following birds fledged young:

| | Breeding pairs fledging young | |
|---|---|---|
| Species | Number | Percent |
| Western bluebird | 70 | 68.0 |
| Mountain bluebird | 12 | 11.6 |
| House wren | 10 | 9.7 |
| Violet-green swallow | 4 | 3.9 |
| White-breasted nuthatch | 3 | 2.9 |
| Mountain chickadee | 2 | 1.9 |
| Pygmy nuthatch | 1 | 1.0 |
| Tree swallow | 1 | 1.0 |
| Total | 103 | 100.0 |

[3]*Unpublished data on file, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.*

Five small boxes constructed as described in this note were placed at the same height, density range, and in the area as the 100 boxes. The first year these boxes were used by two pairs of western bluebirds and one pair each of mountain bluebird, violet-green swallow, and white-breasted nuthatch.

Thirty of the large nest boxes with 3-inch entry holes placed 20 feet above ground and greater than one-fourth mile apart in open to dense old-growth ponderosa pine and mixed conifer forests with some natural cavities have been used by western and mountain bluebirds, tree swallows, common flickers, American kestrels, and red squirrels (*Tamiasciurus hudsonicus*) (fig. 5).

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**Figure 5.—An American kestrel feeding young in a large nest box.**


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# PROJECT BLUEBIRD

Prepared by
Bob Walters

Utah Division of Wildlife Resources
Nongame Section

The bluebird, particularly the western bluebird (but also the mountain bluebird), is believed to be on the decline in the state of Utah and throughout the West. The reasons for this decline probably relate to those suggested as the causes* of the drop in eastern bluebird numbers back East including:

1. Decline in winter food supply (largely wild berries) due to land clearings for croplands, highways, commercial and residential developments, and that eaten by the starling;

2. Adverse weather in breeding and wintering areas which may coat food with ice and snow, making it impossible for bluebirds to maintain adequate body temperatures;

3. Insecticides which may kill the bird directly or kill adult and young bluebirds which feed on insects which have been poisoned;

4. Destruction of breeding habitat or, more specifically, the loss of cavity nest sites including

   - removal of dead trees and/or branches
   - replacement of wooden fence posts with metal posts
   - removal of woodlots, hedgerows, orchards and pastures, and replacement with open space and/or crops; and

5. Competition with nonnative bird species (starling, house sparrow) which build their nests in cavities and, therefore, deprive bluebirds of nest sites.

If the cause of the decline in bluebird numbers here in Utah is in any way due to 4 and 5 above, then by building and maintaining nest boxes, it is quite likely you will help to stop the decline as well as provide yourself with hours of enjoyment in observing these birds. Even if bluebirds are not attracted to your nest box, a wealth of other species, excluding the house sparrow whose nest must be removed, will benefit and use your nest box indefinitely.

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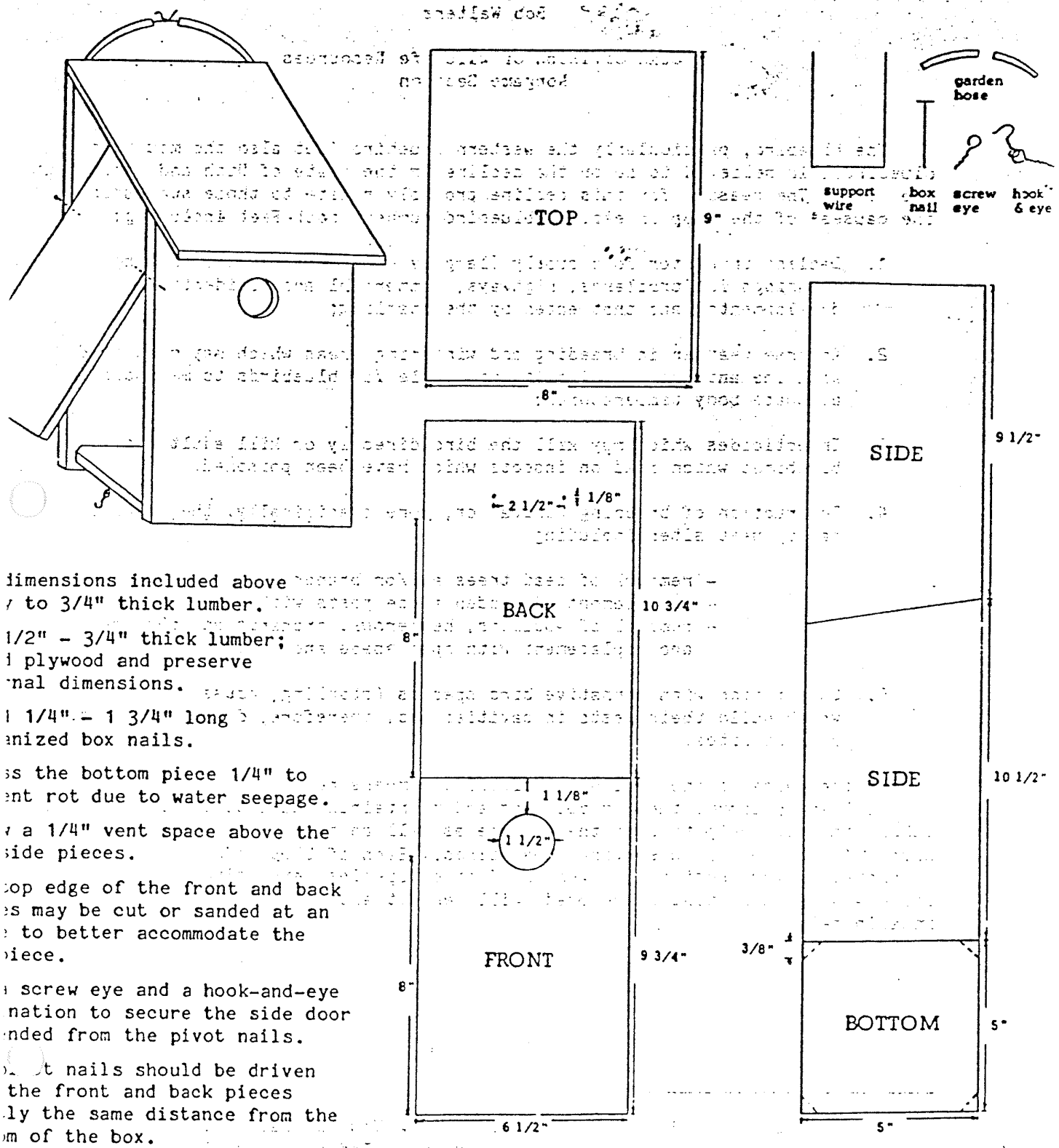
*From L. Zeleny. 1976. The Bluebird: How You Can Help Its Fight For Survival. Bloomington, IN and London, England: Indiana Univ. Press. 170 pp.

# PROJECT BLUEBIRD
# DIRECTIONS FOR BUILDING A SIDE-OPENING BLUEBIRD NEST BOX

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to better accommodate the
piece.

screw eye and a hook-and-eye
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nded from the pivot nails.

t nails should be driven
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ly the same distance from the
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Modified from a bluebird nest box plan in the following:

L. Zeleny. 1976. The Bluebird: How You Can Help Its Fight For

# PROJECT BLUEBIRD
## DIRECTIONS FOR LOCATING, MOUNTING, MONITORING AND MAINTAINING A BLUEBIRD NEST BOX

### LOCATION

- Western and mountain bluebirds* are, in general, edge species (they may be found along borders or boundaries where one type of vegetation meets a different type, such as locations where a forest gives way to a meadow) and, therefore, do not live in dense woods or closely built residential areas.

- Boxes should be placed in areas which generally resemble the following habitats: orchards, farmyards, roadsides, open woodlands, fields and pasturelands.

- Most parks, golf courses and vacant lots in urban settings, and fence lines along fields in rural areas will provide suitable locations for nest boxes since these areas normally have a good mix of open space and occasional clumps of trees.

- If the box or boxes are not placed on your private property, ask the owner(s) for permission to do so before hanging your box(es)!

### MOUNTING INSTRUCTIONS

- Position the box so that, when mounted, the entrance hole faces open space (pasture, meadow, lawn, etc.) and, where possible, the south or southeast.

- Mount the box 5 to 10 feet above the ground to discourage vandalism by children and attacks on bluebirds by domestic cats.

- Suspend the box from "protected" wire on a pole, fence post or tree. (If a hole large enough to allow a nail to pass through it is drilled through the back of the box, the box can be supported by a single nail driven into a pole or post at a slightly downward angle--never drive a nail into a live tree!)

### MONITORING AND MAINTENANCE INSTRUCTIONS

- In early March when bluebirds begin to arrive from wintering areas to the south (both species are summer residents in Utah), begin to take note of the use of your nest box by birds.

- Using binoculars, determine how many young birds are produced each year (mind your distance when observing the birds to avoid disturbing them) and attempt to keep a record. Perhaps a younger family member or a parent can pick up where you leave off so as to maintain a long-term record of activity and nesting success.

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*A relatively inexpensive but good key to bird identification is Birds of North America: A Guide to Field Identification written by C. S. Robbins, B. Bruun and H. S. Zim and published by Western Publishing Company under the trademark of Golden Press.

- A large variety of other cavity-nesting bird species** may utilize your nest box and should not, with the exception of the house sparrow, be discouraged! Starlings (which are not native to Utah and considered nuisance species) will not use the nest box because the entrance hole is simply too small.

- If house sparrows (which are not native to Utah and, therefore, undesirable) use the nest box, open it up and remove the nest, recognized as a large, domed and loosely constructed mass of grass and straw. House sparrows lay 5-6 greenish white speckled eggs. Bluebird nests resemble a neat cup. Bluebirds normally lay 4-6 pale blue eggs. Be sure when you remove a nest that it is that of the house sparrow only! The best way to ensure this is to observe activity at the box until you are satisfied that a house sparrow is indeed nesting.

- November through January of each year would be a good time to clean and make repairs to boxes which require attention. Repair should include readjustment of the support wire to maintain the proper distance between the box and ground and to allow for continued growth of the tree trunk. Nests should be completely removed each winter so that bluebirds arriving in the spring find empty nest boxes for their use.

- If you have any questions regarding Project Bluebird, call the Division of Wildlife Resources at the telephone numbers listed below and ask to speak to a nongame biologist or an employee familiar with Project Bluebird.

| | | |
|---|---|---|
| Salt Lake Office | Salt Lake City | 533-9333 |
| Northern Regional Office | Ogden | 479-5143 |
| Northeastern Regional Office | Vernal | 789-3103 |
| Central Regional Office | Springville | 489-5678 |
| Southern Regional Office | Cedar City | 586-2455 |
| Southeastern Regional Office | Price | 637-3310 |

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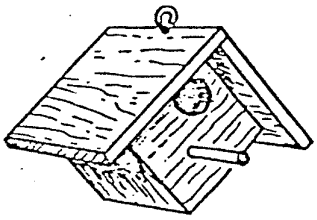
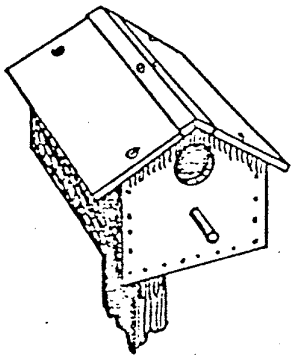
**Cavity-nesting bird species which (based on the 1 1/2" diameter entrance hole) MAY utilize bluebird nest boxes:

| | |
|---|---|
| Downy woodpecker | Mountain chickadee |
| Hairy woodpecker | Plain titmouse |
| Ash-throated flycatcher | Red-breasted nuthatch |
| Western flycatcher | House wren |
| Violet-green swallow | Bewick's wren |
| Tree swallow | House sparrow |
| Black-capped chickadee | |

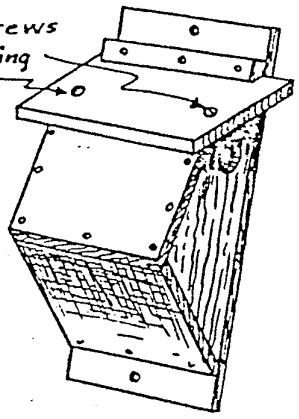
OREGON
Fish & Wildlife

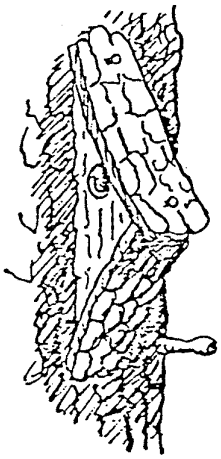
# BIRD HOUSES



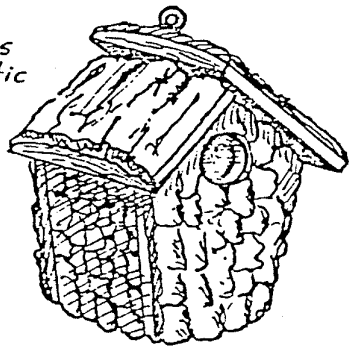


Remove Screws for Cleaning





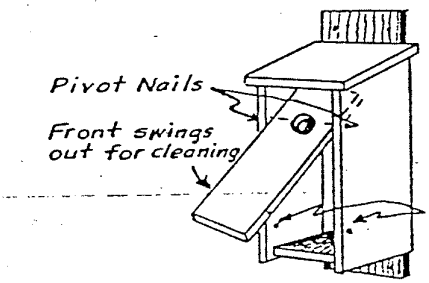
Many Birds prefer Rustic Houses

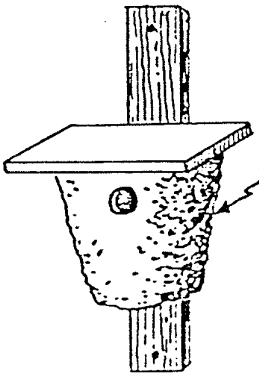


Pivot Nails

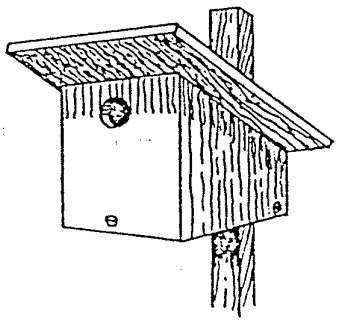
Front swings out for cleaning

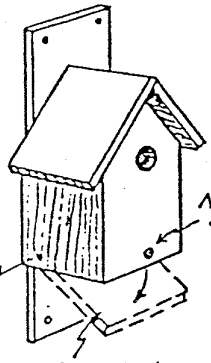
Holding Nails





Wood-Fiber Flower Pot

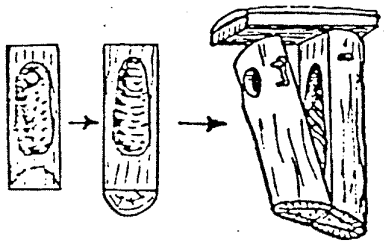


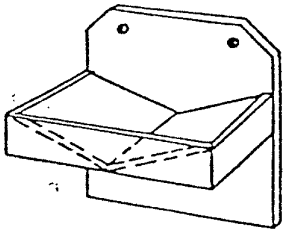


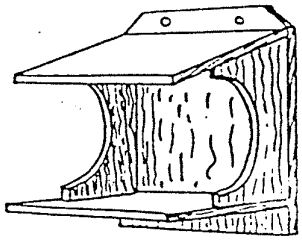
Nail or Screw

Pivot Nails

Bottom Swings down for Cleaning



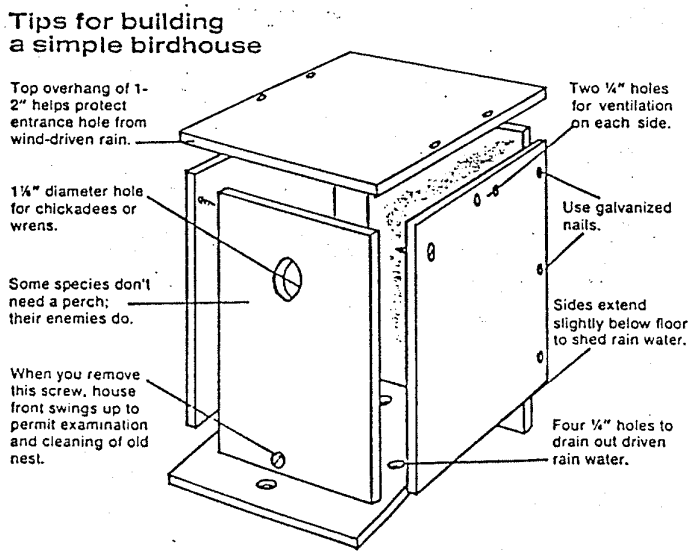




Nesting shelves for Robins & Barn Swallows

| SPECIES | HOUSE AND HOLE DIMENSIONS | PLACEMENT | COLORS | CITY | SUBURBS | COUNTRY | SPARROW CONTROL | STARLING CONTROL | SPECIAL NOTES |
|---|---|---|---|---|---|---|---|---|---|
| Saw-whet Owl | Same as Flicker. | same | same | poor | poor | fair | no | yes | Open wooded areas or dead trees above surrounding foliage is best place for house. Add wood shavings. |
| Robin | 6x6" base x 8" high. Roof required for rain protection. | On side of building or on arbor. | earth tones, wood | fair | fair | fair | no | no | Use is irregular. Prefers open country. Likes water best. |
| Barn Swallow | Same as Robin. | same | same | poor | fair | excellent | no | no | Same as Robin. |
| Phoebe | Same as Robin. | same | same | poor | fair | fair | no | no | Same as Robin. |
| Barn Owl | 10x18" base x 22" high. Hole: 5" with base of 4" above floor. | 12-18' above ground. | earth tones | poor | poor-fair | good | no | no | Locate house near buildings, barns, or open fields. |

Information was taken from "Castles In The Air", by Don Grussing, National Wildlife, and "Nest Box Specifications", by Oregon Fish and Wildlife.



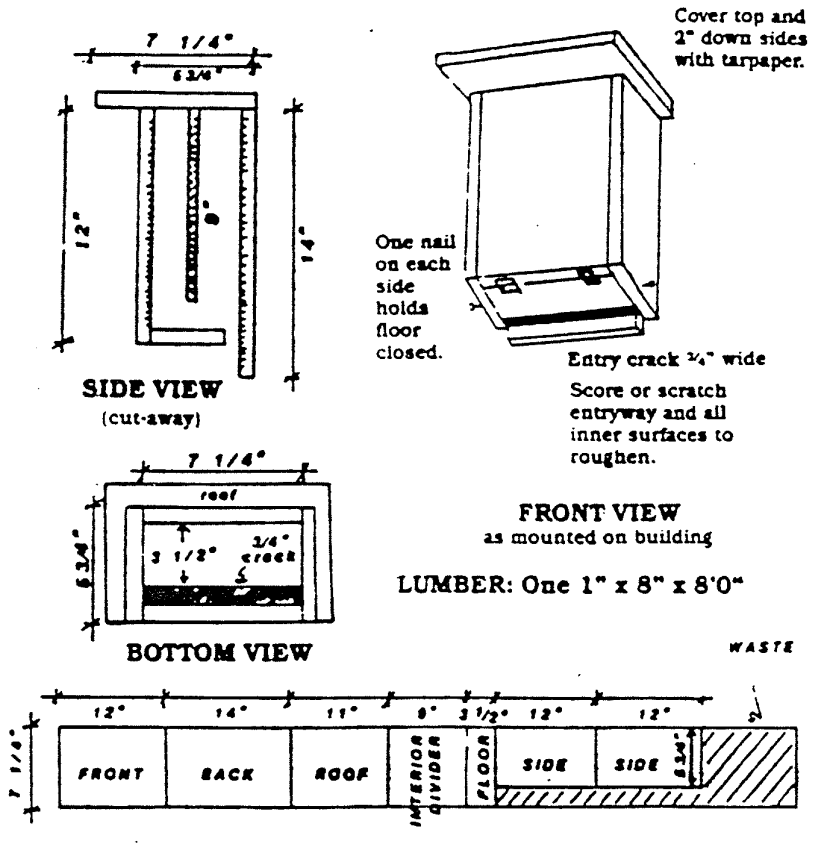
| SPECIES | HOUSE AND HOLE DIMENSIONS | PLACEMENT | COLORS | CITY | SUBURBS | COUNTRY | SPARROW CONTROL | STARLING CONTROL | SPECIAL NOTES |
|---|---|---|---|---|---|---|---|---|---|
| Flicker | 7x7" base x 18" high. Hole: 2½" centered 14" above floor. | Post 8-20' high. | earth tones | fair | good | good | yes | yes | Needs 4" of sawdust or wood shavings for nesting. Open wooded areas on dead trees above surrounding foliage make best areas for placing houses. |
| Carolina Wren | 4x4" base x 8" high. Hole: 1½". | Post 6-10' high. May be hung from tree limb in sun or shade. | earth tones | poor | fair | good | yes | no | Prefers proximity to thick underbrush. |
| Nuthatch | 4x4" base x 10" high. Hole: 1¼" centered 7½" above floor. | Post 12-25' high on tree limb. Place along wooded areas or old orchards. | like a natural cavity | poor | poor | fair | yes | no | Should be bark covered, and rustic. |
| Downy Woodpecker | Same as Nuthatch. Hole: 1½". | same | same | poor | poor | poor | yes | no | Prefers own excavations. Needs sawdust or wood shavings for nesting materials. Rustic houses are probably more acceptable. |
| Hairy Woodpecker | 6x6" base x 15" high. Hole: 1½". | Same as Nuthatch. | same | poor | poor | poor | yes | no | Same as Nuthatch. |
| Crested Flycatcher | 6x6" base x 15" high. Hole: 2" centered 6-8" from floor. | 8-20' high on post or tree limb. Shade preferred. | simulate woodpecker cavity | poor | poor | fair | yes | yes | Needs secluded, private spot. Should be covered with bark. |
| Red-headed Woodpecker | Same as Crested Flycatcher | same | same | poor | fair | fair | yes | yes | Needs sawdust or wood shavings for nesting material. |
| Wood Duck | 10x10" base x 24" high. Hole: should be an ellipse 4" wide x 3" high centered 20" above floor; this exclues most raccoons. | On post 2-5' over water or on tree 12-40' high. Hole should face water. | earth tones | poor | poor | good | no | yes | Shavings or sawdust 3-4" needed for nesting. If wetlands or lake is within ¼ mile, wood duck will explore nearby habitat. |
| Sparrow Hawk | Same as Wood Duck. | same | same | poor | poor | fair | no | yes | Open approach needed; box should be on edge of woodlot or facing open areas in an isolated tree near fields or water. |
| Screech Owl | Same as Wood Duck. | same | same | poor | poor | fair | no | yes | Prefers open woods or edge of woodlots. Wood shavings should be added. |

# BUILD A BETTER BIRDHOUSE

Each bird species that will use man-made birdhouses occupies a particular ecological niche. A basic understanding of where different kinds of birds prefer to live, and what they prefer to live in will help you attract the kind of bird that you want to see. Rough wood should be used so young birds can climb out. Rough cedar, pine or exterior plywood are good durable materials. Several one-quarter inch ventilation holes should be provided to prevent suffocation of young birds, and three or four one-quarter inch holes in the floor for drainage. Galvanized nails or brass screws are nice because they will not rust like ordinary nails or screws. Houses that face away from the prevailing weather are more inviting to nesting birds. Young birds will not become trapped in houses that tilt forward at the top.

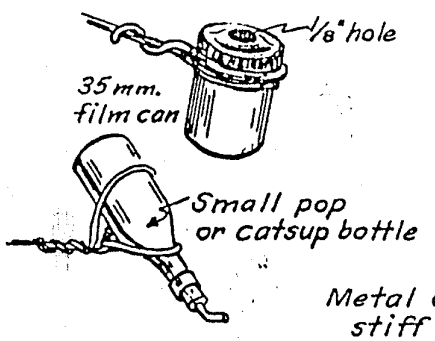
| SPECIES | HOUSE AND HOLE DIMENSIONS | PLACEMENT | COLORS | CITY | SUBURBS | COUNTRY | SPARROW CONTROL | STARLING CONTROL | SPECIAL NOTES |
|---|---|---|---|---|---|---|---|---|---|
| House Wren | 4x4" (or 4x6") base x 8" high. Hole: 1" centered 6" above floor. | Post 5-10' high or can be hung in tree with 60% sun or partly sun-lit spot. | white, earth tones | good | excellent | excellent | no | no | Easiest to attract of all native birds. These houses may be hung from a tree limb. |
| Chickadee | 4x4" (or 5x5") base x 8" high. Hole: 1 & 1/8" centered 6" above floor. | Post 4-8' high, 40-60% sun. Put in orchards or wooded areas. | earth tones | good | good | good | no | no | Easier to attract than formerly thought. Needs lg. trees in area. Prefer rustic houses. |
| Tree Swallow | 5x5" base x 6" high. Hole: 1½" centered 4" above floor. | Post 5-8' high in open area, 50-100% sun. | earth tones, grey | poor-fair | fair-good | good-excellent | yes | no | Proximity to water (within 2 miles) a must. Place several together on a post or dead tree. |
| Violet Green Swallow | Same as Tree Swallow. | same | same | same | same | same | same | same | A western bird exclusively. |
| Purple Martin | Multiple compartments 6x6x6". Hole: 2½" with base of hole 2¼" from floor. | Post 15-20' high in open. A colony of houses together will attract these birds. | white | poor-fair | poor-good | fair-excellent | yes | yes | Open yard with no tall trees is best. Proximity to water is important. |
| House Finch | 6x6x6". Hole: 2". | Post 8-12" high. 40-60% shade. | earth tones | fair | fair | fair | yes | yes | A western bird common in some eastern areas. |
| Bluebird | 5x5" base x 8" high. Hole: 1½" centered 6" above floor. | Post 3-5' high in open, sunny areas on fence posts or in trees. | earth tones | poor | fair | excellent | yes | no | Likes open areas, especially facing a field. |
| Bewick's Wren | 4x4" base x 8" high. Hole: 1¼". | Post 6-10' high. 50% sun. | earth tones | fair | good | excellent | yes | no | Likes thickets, and hedges. |
| Tufted Titmouse | 4x4" base x 8" high. Hole: 1¼". | Post 4-10' high in sun or shade. | earth tones | fair | fair-good | excellent | yes | no | Prefers to be near or in wooded areas. |

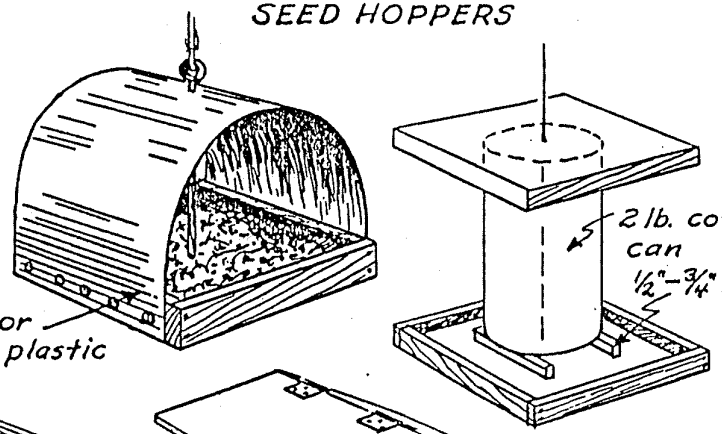
Bat Box Plan Diagram

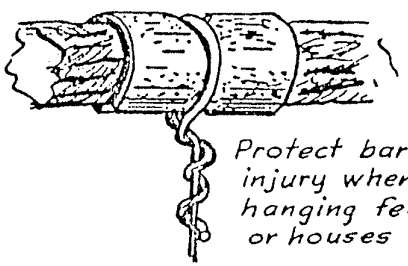


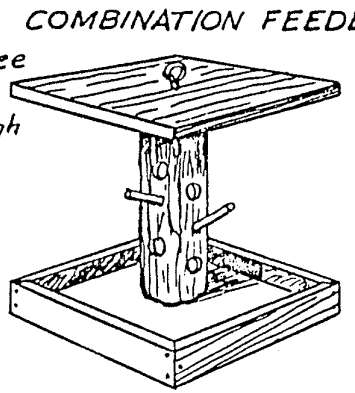

Bat Box plans adapted from Woodworking for Wildlife by Carroll L. Henderson. Nongame Wildlife Program. Minnesota Department of Natural Resources, St. Paul, Minnesota.

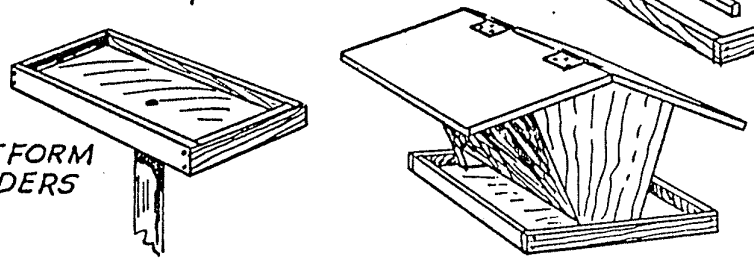
# BIRD FEEDERS

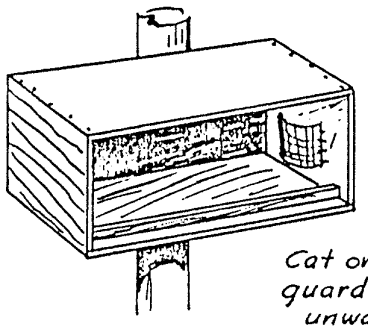


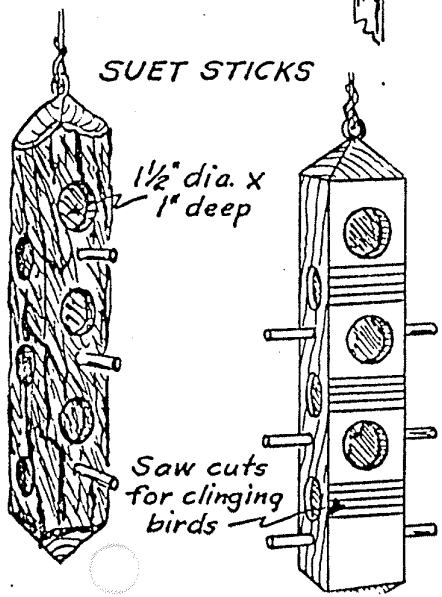



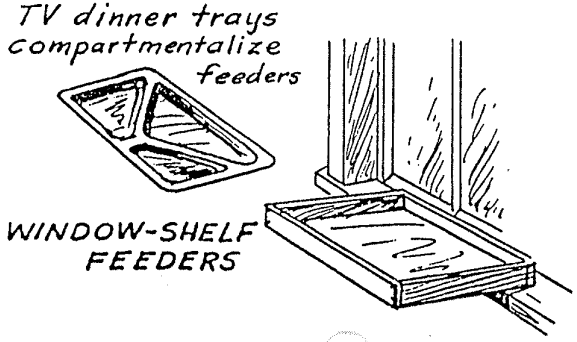



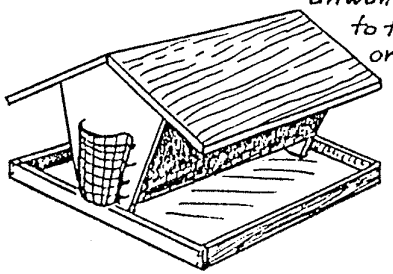



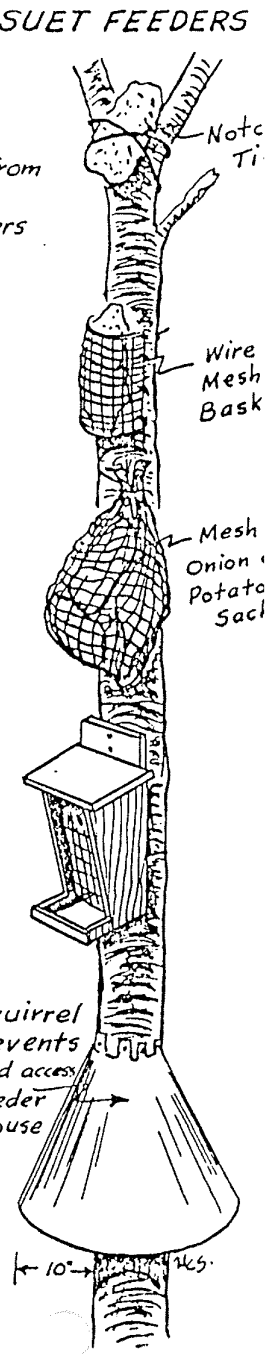





Most important of the three essentials for bird life is food. Water and shelter play a lesser role. Feeding may be of two different kinds--summer and winter. Correct feeding requires varying diet with the season. Summer feeding is usually unnecessary but will bring more birds to the feeding area for people to enjoy. Winter is the important time for feeding. Begin in early fall to attract and hold birds that would otherwise migrate farther south. Once lured from their natural wintering areas, birds concentrate around feeders in larger numbers than the area can naturally support. They are now your dependents. Feeding must continue until spring when natural foods are again abundant.

## BIRD DIETS

Feeding birds is largely an art which must be learned through experience and observation. On the basis of diet, birds may be roughly separated into seed eaters and insect eaters. This division is not a clean one, for most fit both categories at some time in their life. The use of several different feeders or combination feeders should satisfy requirements of all.

## BIRD FOODS

SUET - Insect eaters like nuthatches and woodpeckers will consume large amounts of suet when insects and larva are not available. Avoid stringy suet. It is hard for birds to eat. Suet may be made available plain or in any large-mesh container. A better way is to grind it, melt in a double boiler, and pour into molds to harden. It is more durable if melted twice before molding into cakes. Small frozen food dishes make good molds. Suet-seed cakes may be made by adding the melted suet to any of the seeds or mixtures listed below. Melted suet or suet-seed mixtures should be placed in suet stick feeders while in a semi-liquid state.

PEANUT BUTTER - May be used in place of suet in manner described above. It is much more expensive, however. Look into obtaining substandard quantities for bird feeding.

SEEDS - Even insect eaters consume some seeds, especially in winter, Seeds will attract many different kinds of birds. Grocery, pet, or feed stores will carry the following material for seed feeding.

| | | | | | |
|---|---|---|---|---|---|
| Sunflower | Millet | Wheat | Rice | Oatmeal | Popcorn |
| Hempseed | Buckwheat | Cracked corn | Chopped nuts | Bread crumbs (dried) | Commercial birdseed mix |

Dog biscuits, rabbit food, raisins, and other such items are also used in mixtures. A good homemade mixture is 3 parts sunflower, 3 parts hempseed, 3 parts millet, and 1 part buckwheat. Several mixtures should be experimented with to determine which is preferred by birds in your area.

GRIT - Sand, very fine gravel, or crushed charcoal should be added in small amounts to suet-seed cakes or seed mixtures to complete the diet.

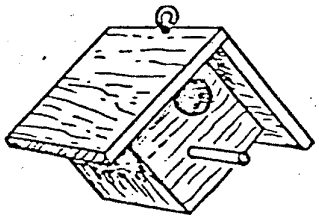
HUMMINGBIRD FOOD - A solution of 1 part sugar or thinned honey to 4 parts water. Red food coloring may be added or the outside of the feeder painted an attractive color.

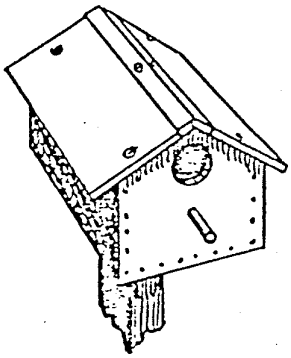
## PLACEMENT OF FEEDERS

Feeders should be placed with protection in mind. Squirrels, cats, or other predators should be unable to gain access to feeding stations. Escape routes to nearby trees or shrubbery must be available. These cover plants also provide a place to perch before going to feed. Feeders should be protected from weather by facing them away from the wind. South or east sides of buildings provide the most sun and warmth. Placement must also consider ease in servicing and refilling. Locations where large drifts form or high ladders are required will likely result in empty and ineffective feeders.

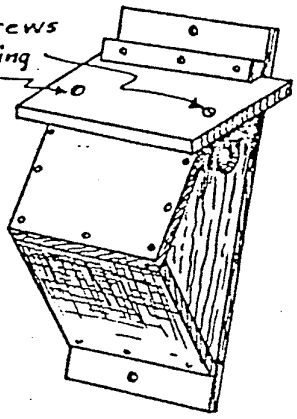
OREGON
Fish & Wildlife

# BIRD HOUSES

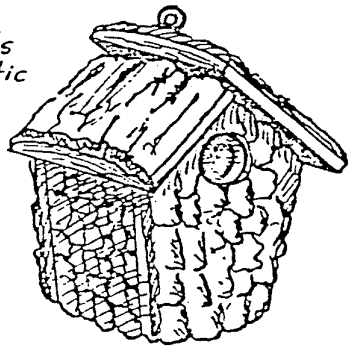




Remove Screws for Cleaning



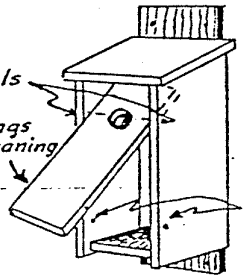
Many Birds prefer Rustic Houses

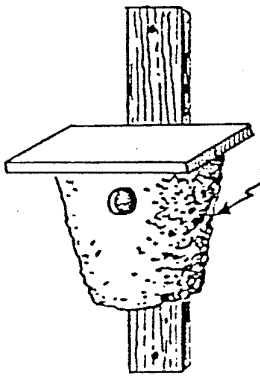


Pivot Nails

Front swings out for cleaning

Holding Nails





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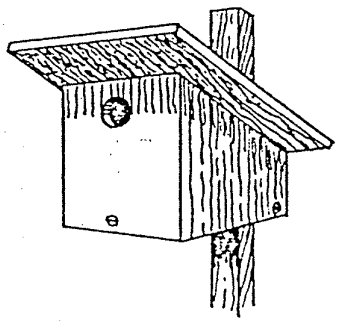
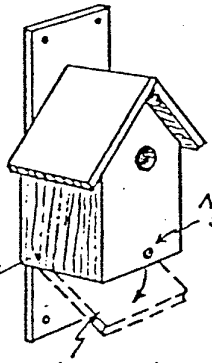
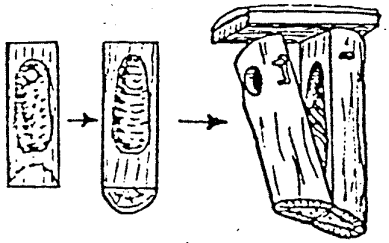


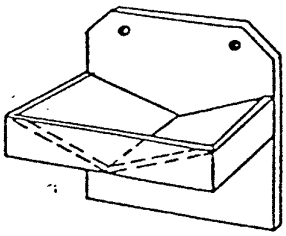


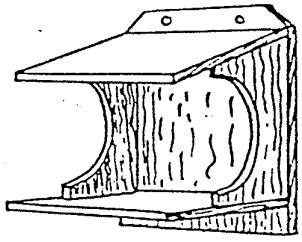
Nail or Screw

Pivot Nails

Bottom Swings down for Cleaning







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| Barn Swallow | Same as Robin. | same | same | poor | fair | excellent | no | no | Same as Robin. |
| Phoebe | Same as Robin. | same | same | poor | fair | fair | no | no | Same as Robin. |
| Barn Owl | 10x18" base x 22" high. Hole: 5" with base of 4" above floor. | 12-18' above ground. | earth tones | poor | poor-fair | good | no | no | Locate house near buildings, barns, or open fields. |

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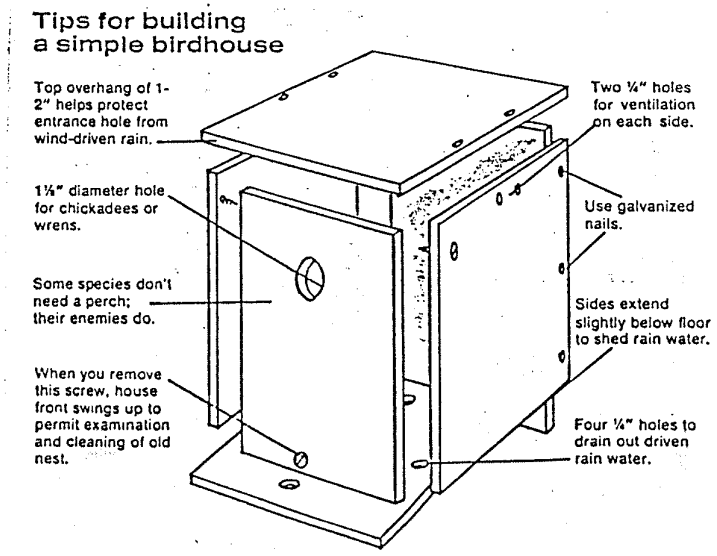

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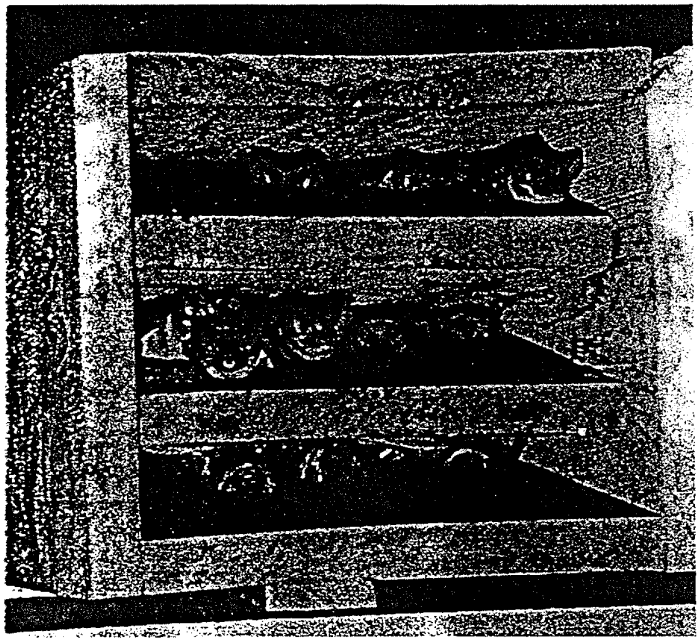
| Downy Woodpecker | Same as Nuthatch. Hole: 1½". | same | same | poor | poor | poor | yes | no | Prefers own excavations. Needs sawdust or wood shavings for nesting materials. Rustic houses are probably more acceptable. |
| Hairy Woodpecker | 6x6" base x 15" high. Hole: 1½". | Same as Nuthatch. | same | poor | poor | poor | yes | no | Same as Nuthatch. |
| Crested Flycatcher | 6x6" base x 15" high. Hole: 2" centered 6-8" from floor. | 8-20' high on post or tree limb. Shade preferred. | simulate woodpecker cavity | poor | poor | fair | yes | yes | Needs secluded, private spot. Should be covered with bark. |
| Red-headed Woodpecker | Same as Crested Flycatcher | same | same | poor | fair | fair | yes | yes | Needs sawdust or wood shavings for nesting material. |
| Wood Duck | 10x10" base x 24" high. Hole: should be an ellipse 4" wide x 3" high centered 20" above floor; this exclues most raccoons. | On post 2-5' over water or on tree 12-40' high. Hole should face water. | earth tones | poor | poor | good | no | yes | Shavings or sawdust 3-4" needed for nesting. If wetlands or lake is within ¼ mile, wood duck will explore nearby habitat. |
| Sparrow Hawk | Same as Wood Duck. | same | same | poor | poor | fair | no | yes | Open approach needed; box should be on edge of woodlot or facing open areas in an isolated tree near fields or water. |
| Screech Owl | Same as Wood Duck. | same | same | poor | poor | fair | no | yes | Prefers open woods or edge of woodlots. Wood shavings should be added. |

# BUILD A BETTER BIRDHOUSE

Each bird species that will use man-made birdhouses occupies a particular ecological niche. A basic understanding of where different kinds of birds prefer to live, and what they prefer to live in will help you attract the kind of bird that you want to see. Rough wood should be used so young birds can climb out. Rough cedar, pine or exterior plywood are good durable materials. Several one-quarter inch ventilation holes should be provided to prevent suffocation of young birds, and three or four one-quarter inch holes in the floor for drainage. Galvanized nails or brass screws are nice because they will not rust like ordinary nails or screws. Houses that face away from the prevailing weather are more inviting to nesting birds. Young birds will not become trapped in houses that tilt forward at the top.

| SPECIES | HOUSE AND HOLE DIMENSIONS | PLACEMENT | COLORS | CITY | SUBURBS | COUNTRY | SPARROW CONTROL | STARLING CONTROL | SPECIAL NOTES |
|---|---|---|---|---|---|---|---|---|---|
| House Wren | 4x4" (or 4x6") base x 8" high. Hole: 1" centered 6" above floor. | Post 5-10' high or can be hung in tree with 60% sun or partly sunlit spot. | white, earth tones | good | excellent | excellent | no | no | Easiest to attract of all native birds. These houses may be hung from a tree limb. |
| Chickadee | 4x4" (or 5x5") base x 8" high. Hole: 1 & 1/8" centered 6" above floor. | Post 4-8' high, 40-60% sun. Put in orchards or wooded areas. | earth tones | good | good | good | no | no | Easier to attract than formerly thought. Needs lg. trees in area. Prefer rustic houses. |
| Tree Swallow | 5x5" base x 6" high. Hole: 1½" centered 4" above floor. | Post 5-8' high in open area, 50-100% sun. | earth tones, grey | poor-fair | fair-good | good-excellent | yes | no | Proximity to water (within 2 miles) a must. Place several together on a post or dead tree. |
| Violet Green Swallow | Same as Tree Swallow. | same | same | same | same | same | same | same | A western bird exclusively. |
| Purple Martin | Multiple compartments 6x6x6". Hole: 2½" with base of hole 2¼" from floor. | Post 15-20' high in open. A colony of houses together will attract these birds. | white | poor-fair | poor-good | fair-excellent | yes | yes | Open yard with no tall trees is best. Proximity to water is important. |
| House Finch | 6x6x6". Hole: 2". | Post 8-12" high. 40-60% shade. | earth tones | fair | fair | fair | yes | yes | A western bird common in some eastern areas. |
| Bluebird | 5x5" base x 8" high. Hole: 1½" centered 6" above floor. | Post 3-5' high in open, sunny areas on fence posts or in trees. | earth tones | poor | fair | excellent | yes | no | Likes open areas, especially facing a field. |
| Bewick's Wren | 4x4" base x 8" high. Hole: 1¼". | Post 6-10' high. 50% sun. | earth tones | fair | good | excellent | yes | no | Likes thickets, and hedges. |
| Tufted Titmouse | 4x4" base x 8" high. Hole: 1¼". | Post 4-10' high in sun or shade. | earth tones | fair | fair-good | excellent | yes | no | Prefers to be near or in wooded areas. |



BAXTER AND CAROL ADAMS

*Putting up a bat house is one of the more rewarding ways to help wildlife. By providing bats with roosting habitat, you also benefit from having fewer yard and garden pests. These bats are Mexican free-tails.*

# Why Build a Bat House?

AMERICA'S BATS ARE an invaluable natural resource. Yet due to decades of unwarranted human fear and persecution, bats are in alarming decline. By putting up a bat house, you can help. You also will benefit from having fewer yard and garden pests and will enjoy learning about bats and sharing your knowledge with friends and neighbors. Few efforts on behalf of wildlife are more fun or rewarding than helping bats.

As the primary predators of night-flying insects, bats play a vital role in maintaining the balance of nature. And, as consumers of vast numbers of pests, they rank among humanity's most valuable allies. A single little brown bat can catch hundreds of mosquitoes in an hour, and a typical colony of 150 big brown bats can protect local farmers from the costly attacks of 18 million rootworms each summer. Cucumber and June beetles, stink bugs, leafhoppers, cutworm and corn ear worm moths, all well-known pests, are just a few of the many insects known to be consumed by these frequent users of bat houses.

Although bat house building may someday contribute greatly even to saving endangered species, our first goal is to preserve America's most abundant bats in sufficient numbers to maintain nature's balance. Their loss contributes to growing demands for toxic pesticides that increasingly threaten our personal and environmental health.

Recent BCI research on bat houses documents substantial success and exciting potential for helping rebuild healthy populations of some of America's most valuable species. More importantly, it shows how slight modifications, often as simple as moving a house only a few feet higher or into slightly more or less sun, can substantially improve the odds of successful occupation by bats.

These results, combined with new knowledge of bat preferences, are extremely encouraging. However, there is still much we need to learn in order to attract nursery colonies on a consistent basis in a wide variety of climates. We also have much to learn about how to meet the needs of individual species.

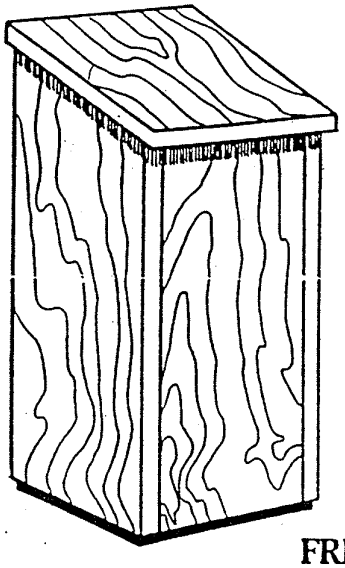
Bat Conservation International's North American Bat House Research Project is a long-term study to determine bat needs and how best we can help. By participating in this project, you can make a special contribution to our understanding of the needs of bats and share in the thrill of scientific discovery. With your help, we can make real conservation progress.

Scott James

(Reprinted with permissio

# BAT CONSERVATION INTERNATIONAL'S
# Official Bat-House Builder's Guide

**Read instructions and recommendations completely through before beginning**



Bat houses have been used for more than 60 years in Europe, and they have become increasingly popular in the U.S. We have compiled the following recommendations crucial to bat house placement and use based on studies done in the U.S. and Canada on bats roosting in man-made structures. The following bat house plans are designed according to the most up-to-date information available on the preferences of North American crevice-roosting bats. The varied crevice widths accommodate several of North America's most abundant and widespread species.

## LOCATION

Bat houses located near a permanent source of water, especially a marsh, lake or river, are by far the most likely to attract bats. They should be hung roughly 12–15 feet above the ground in a location where entry is unobstructed and bats have easy access. A bat house can be placed on a tree or pole, although those attached to the side of a building have had the most success (possibly because of increased temperature stability and protection from predators).

*(continued inside)*

## FREQUENTLY ASKED BAT HOUSE QUESTIONS

***How can I attract bats to my bat house?***
Bats find bat houses just as birds find bird houses. If roosts are needed in your area, and your bat house is appropriately located and meets bat requirements, they eventually will find it and move in on their own. Some people have painted the inside of bat houses with moistened bat droppings to establish a bat odor, but no one is certain that this makes houses any more attractive to bats.

***How can I determine the likelihood of attracting bats to my bat house?***
Most North American bats prefer to live within a few hundred yards of water, especially streams, marshes or lakes, although colonies are sometimes found up to a mile or more from such places. In some western areas, they may travel several miles, utilizing only a cattle trough or other similarly small water source. Wherever bats live, they must find enough insects to eat, largely explaining their preference for aquatic habitat. In urban areas the oldest neighborhoods, with their larger trees and more established yards, are most likely to meet bat needs.

***Why might bats not be attracted to my bat house?***
Too great a distance to feeding or drinking sites may be a factor, or heavy use of agricultural or other pesticides that may poison bats or their insect prey. Another reason may be that bats sometimes are prevented from using otherwise ideal summer habitat because potential winter hibernating sites in nearby caves or mines have been eliminated through human disturbance. Finally, bats are unlikely to move into a bat house unless it is needed. Bats are most likely to need alternative roosts, such as bat houses, in areas where roosting sites are insufficient to house as many bats as the local insect population can support.

***Can bats be introduced into areas where they do not already live?***
If appropriate bat species pass through your general area, you may, by putting up a bat house, attract a colony, but there is nothing you can do to artificially introduce them. They have strong homing instincts and likely would return to their original roost. Thus, catching or purchasing bats (which is illegal) for introduction into a new bat house should not be attempted.

***If I have bats living in my attic, but would prefer that they occupy bat houses instead, what should I do?***
Attics or other parts of buildings often provide ideal bat roosting sites. This is especially true for nursery colonies. Bats raising young require stable high temperatures and the space to move up and down to select from a range of temperatures under varied outside weather conditions. Neither natural tree roosts nor bat houses are likely to lure bats out of a good attic! Only excluding them, by plugging their means of entry, is likely to make them move, and even then, they may move to a neighbor's attic instead of living in your bat house. Some excluded bats, however, do move into bat houses, especially if they have few options.

***Do you guarantee that my bat house will be used?***
The only real guarantee is that, used or not, it will make an excellent conversation piece and give you an opportunity to tell your neighbors about the importance of bats! As just outlined, there are several reasons beyond our control why bats might not occupy a bat house.

***What kinds of bats are most likely to use bat houses?***
Throughout the northern two-thirds of the United States and Canada, the little brown bat (*Myotis lucifugus*) and the big brown bat (*Eptesicus fuscus*) are the most likely. These species also occur in the southeastern U.S., but in the Gulf States the southeastern bat (*Myotis austroriparius*) and the Mexican free-tailed bat (*Tadarida brasiliensis*) are the most abundant. In the southwest and western U.S., the Mexican free-tailed bat and a variety of small bat species (often loosely referred to as mouse-eared

*(continued from front)*

### TEMPERATURE CONSIDERATIONS

Since appropriate temperature may determine whether or not a bat house is used, you may wish to consider several factors before choosing a location. Lower temperatures, due to higher altitude or latitude, require that bat houses intended for use by nursery colonies be oriented to receive maximum sun, especially in the morning (southeast exposure). In warm climates, bat houses also should be positioned to receive morning sun, but in hot climates they will require shade by mid-day.

Nursery colonies normally prefer stable temperatures from 80–100° Fahrenheit. Bachelor colonies frequently select cooler roosts, so even if your bat house is too cool for a nursery colony, you may still attract bachelors.

### WHEN TO EXPECT GUESTS

Although there have been reports of bats moving into houses almost immediately, a year to a year and a half is a more common waiting period. Some highly successful bat houses were not occupied until the third year. Reasons for the delay are unknown. Bats may be more likely to discover houses during spring or fall migratory movements, odors may need to dissipate, or the bats may simply require time to get used to a new structure. Hanging houses in the fall or winter may help. If a house is not occupied by the end of the second year, you might try moving it to a new location.

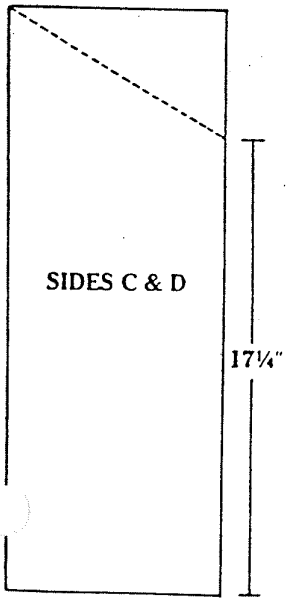
## GETTING STARTED

**MATERIALS:**
One 10′ piece of 1″ X 8″ untreated, rough-sided lumber
One 11″ piece of 1″ X 10″ untreated, rough-sided lumber —this will be the top, (A)
Approximately 30 six-penny galvanized nails
Silicone caulk

**TOOLS:**
Skil saw with crosscut blade
Hammer
Ruler
Tape measure
Pencil
Drill

**NOTES:**

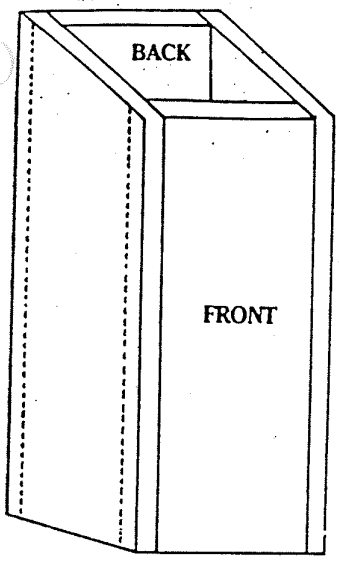
1. Do not use paint, as the odor may repel bats.
2. Bats need a rough surface to secure a foothold. If rough-sawn lumber is unavailable, you can roughen all interior surfaces manually by cutting 1/16″ horizontal grooves at about ½″ intervals.
3. Some types of lumber split easily. Drilling small holes for the nails will reduce this possibility.
4. Lumber will vary in thickness and width. Most 1″ thick lumber is actually only ¾″ thick, and the width of an 8″ board can vary from 7″ to 8″. These plans can be modified for slight variation, but you should try to select lumber that is as close to ¾″ thick and 8″ wide as possible.




STEPS 2-3-4

## ASSEMBLY

1. Cut the 10′ piece of lumber into seven (7) pieces of the following sizes:
   —3 pieces that are 22″ long
   these will be the back (B), and the two sides, (C) and (D)
   —1 piece that is 17¾″ long
   this will be the front (E)
   —1 piece that is 11″ long
   this will be the first partition (F)
   —1 piece that is 12″ long
   this will be the second partition (G)
   —1 piece that is 13″ long
   this will be the third partition (H)
2. Take the two sides, (C) and (D), and measure off 17¼″ along one edge. Make a pencil mark at this point.
3. Draw a diagonal line across the face of each piece from the 22″ end to the pencil mark at 17¼″.
4. Using a skil saw, cut along the diagonal lines. Set these pieces aside.




STEP 7

5. Now you need to cross-cut the angle off the *top end* of each of the following pieces: the top (A), the back (B), the front (E), and the three partitions, (F),(G), and (H). The easiest way to set this angle is to place the skil saw *guide* on the angled cut of one of the side pieces from Step 4, and place the *blade* firmly against the 17¼" edge of the side piece; then lock the guide in place. The angle should be roughly 33°, but will vary depending on the exact width of your lumber.

   NOTE: When you angle off the top end of the front piece (E), the *outside* surface of this piece should measure 17¼" in length.

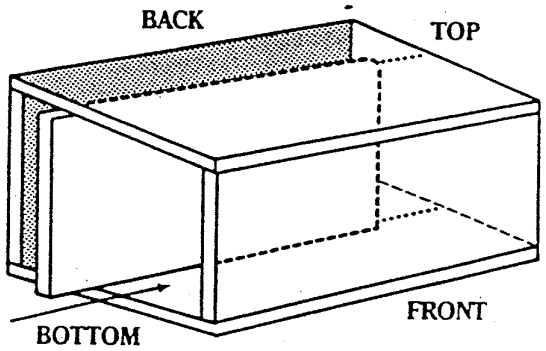
6. Take the two side pieces, (C) and (D), from Step 4. Using a ruler and a pencil, mark the pieces *on both sides* to allow the following crevice widths between the three partitions from front to back in the bat house: ¾", ¾", 1", and 1¾". Be sure to allow for the thickness of each partition and that of the front and back pieces as you mark the crevice widths along each side piece.

   NOTE: The width of the final crevice can vary from ¾" to 1¾" depending on the exact width and thickness of your lumber.

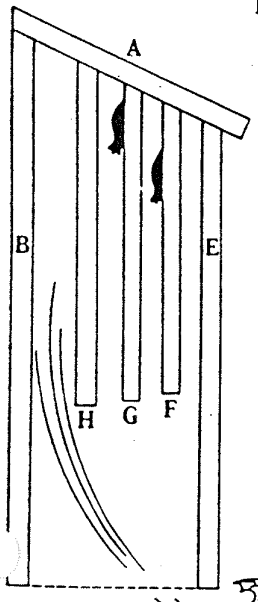
7. Now, you are ready to start building. Take the two sides, (C), and (D), the back (B), and the front (E), and nail them together, angled ends up. *Remember that the side pieces fit over the ends of the front and back pieces.*

8. Now you can insert the partitions. Lay the partially completed house on its side. Take the longest partition and slide it into the box, using the lines closest to the back of the box as a guide for placement. Position the partition so that it is flush with the tops of the sides.

9. Secure the partition in place by nailing along the outside lines you drew in Step 6.




STEPS 8-9-10




10. Follow the same procedure for securing the other two partitions along the remaining lines. The shortest partition should be nearest to the front of the box.

DIMENSIONS:
A—Roof, 11" X 10"
B—Back, 8" X 22"
C & D—Sides 8" wide X 22" at back, 17¼" at front
E—Front, 8" X 17¼"
F—First partition, 8" X 11"
G—Second partition, 8" X 12"
H—Third partition, 8" X 13"

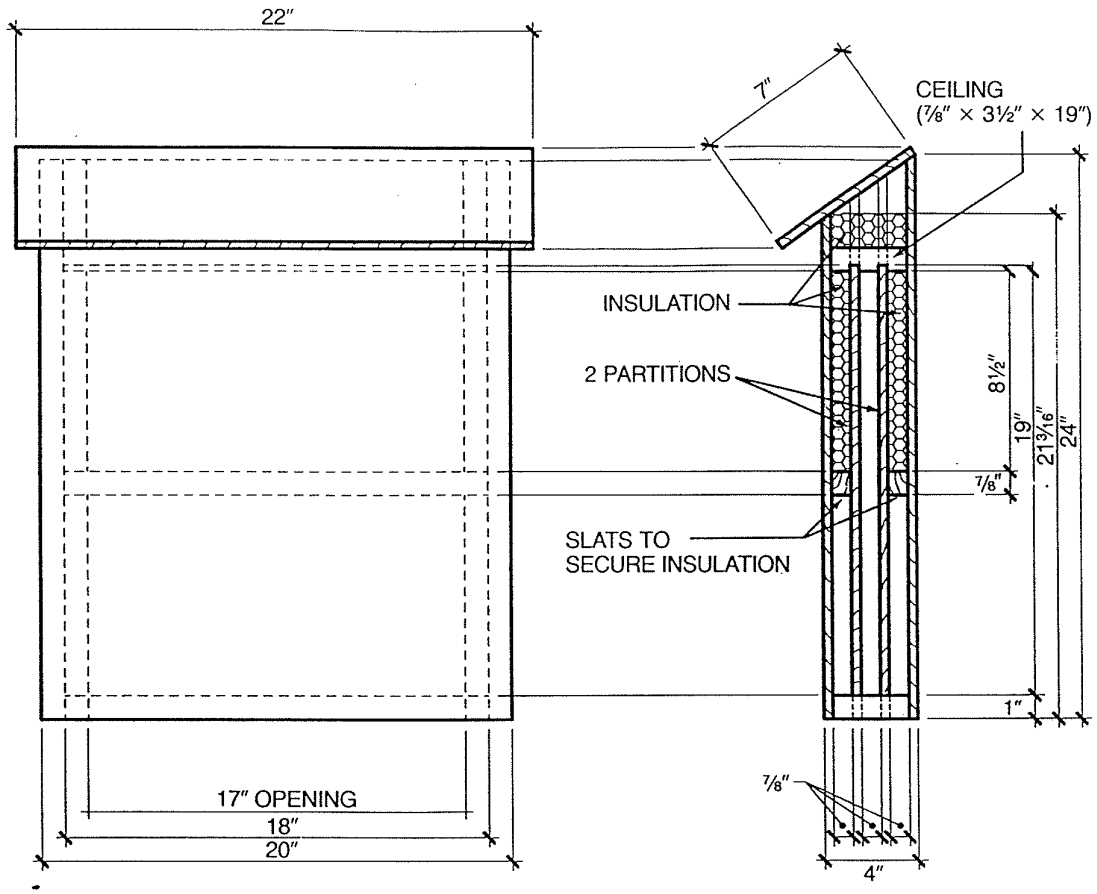
SPACING BETWEEN PARTITIONS, FRONT TO BACK:
¾", ¾", 1", 1¾"

11. Now you can affix the roof. To ensure a tight, weatherproof seam along the top, apply a line of silicone caulk along the perimeter of the main frame. Place the top piece (A) on the frame so that the back edge of the board is flush with the back of the box and creates an overhang in the front and on the sides. Hold firmly and nail the top to the main frame. The completed house should look like the drawing on the front of these plans.

HANGING YOUR BAT HOUSE

Your house can be hung in a variety of ways depending upon where you choose to hang it. A wide selection of nails, screws, hooks, and brackets can be found at your local hardware store. Be inventive, but following installation, we recommend that you check the house periodically to ensure that it is safely anchored in place.

If bats do occupy your house, write and tell us about it!




**Materials needed:**
One 4′ piece of 2″ × 4″ lumber (sides)
One 4′ × 4′ piece of ⅜″ T-111 no-groove exterior plywood (front, back, two partitions, roof)
One 10′ piece of 1″ × 4″ lumber (ceiling, mounting boards)
Remainder to be cut for slats to secure insulation, if used: two ⅞″ × 18″ pieces
Two pieces 39″ × 19″ fiberglass window screening,* wrapped around both sides of both partitions

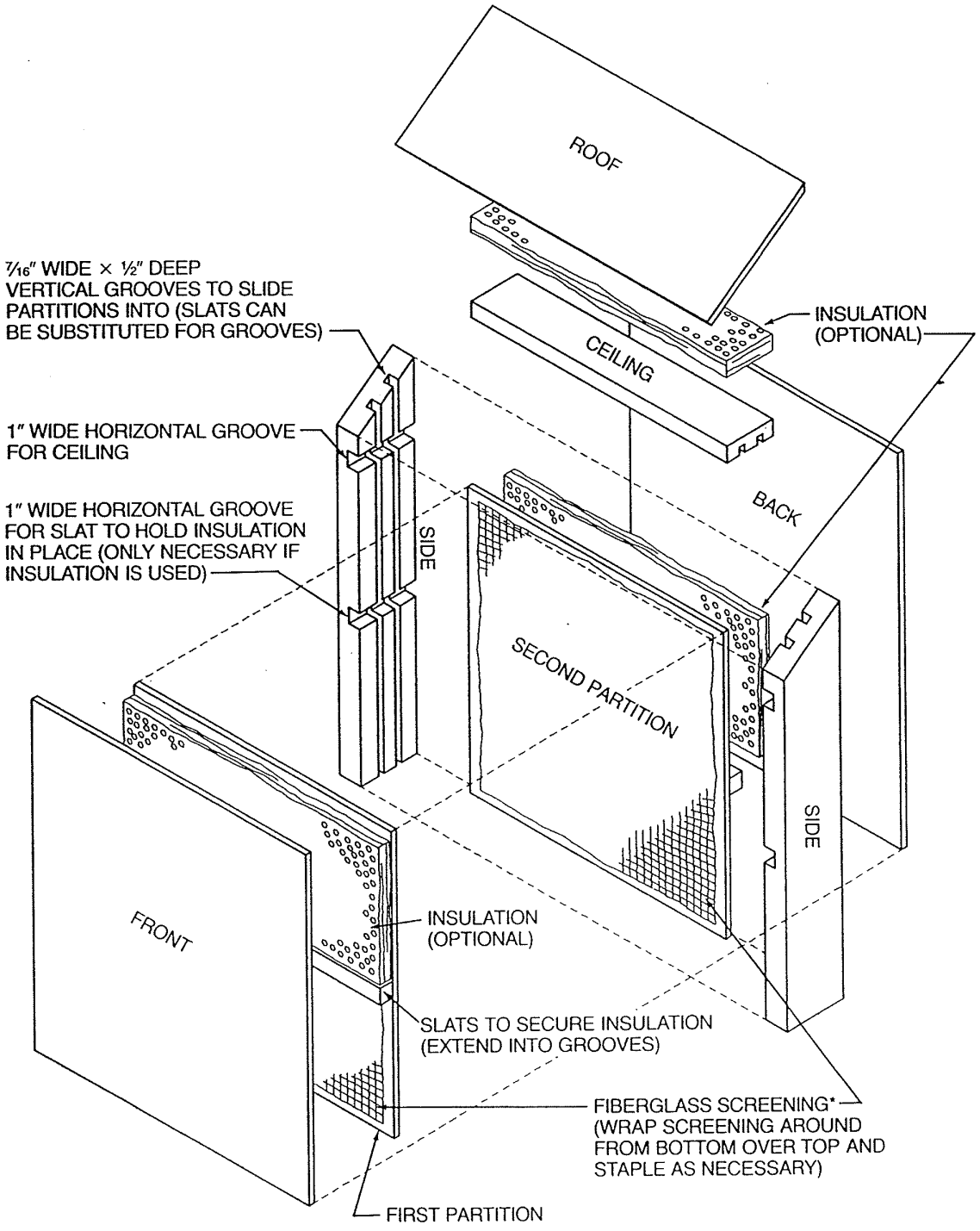
**Optional:**
Two 17½″ × 17½″ pieces Reflextix insulation, folded double (for upper ends of chambers)
One 17½″ × 7″ piece Reflextix insulation, folded double (for attic)

**NOTE:** All lumber sizes given in materials lists are normal rough-cut sizes. Finish-cut lumber from lumber companies will be smaller (for example, a typical finish-cut 2×4 is really only 1½″ × 3½″). Measurements shown on drawings reflect this variation for typical lumber.

If screening or hardware cloth is not used, grooves should be cut narrower to ⅜″ to ensure a tighter fit, and at least one wood surface in each chamber must be rough to provide a surface for the bats to cling to.

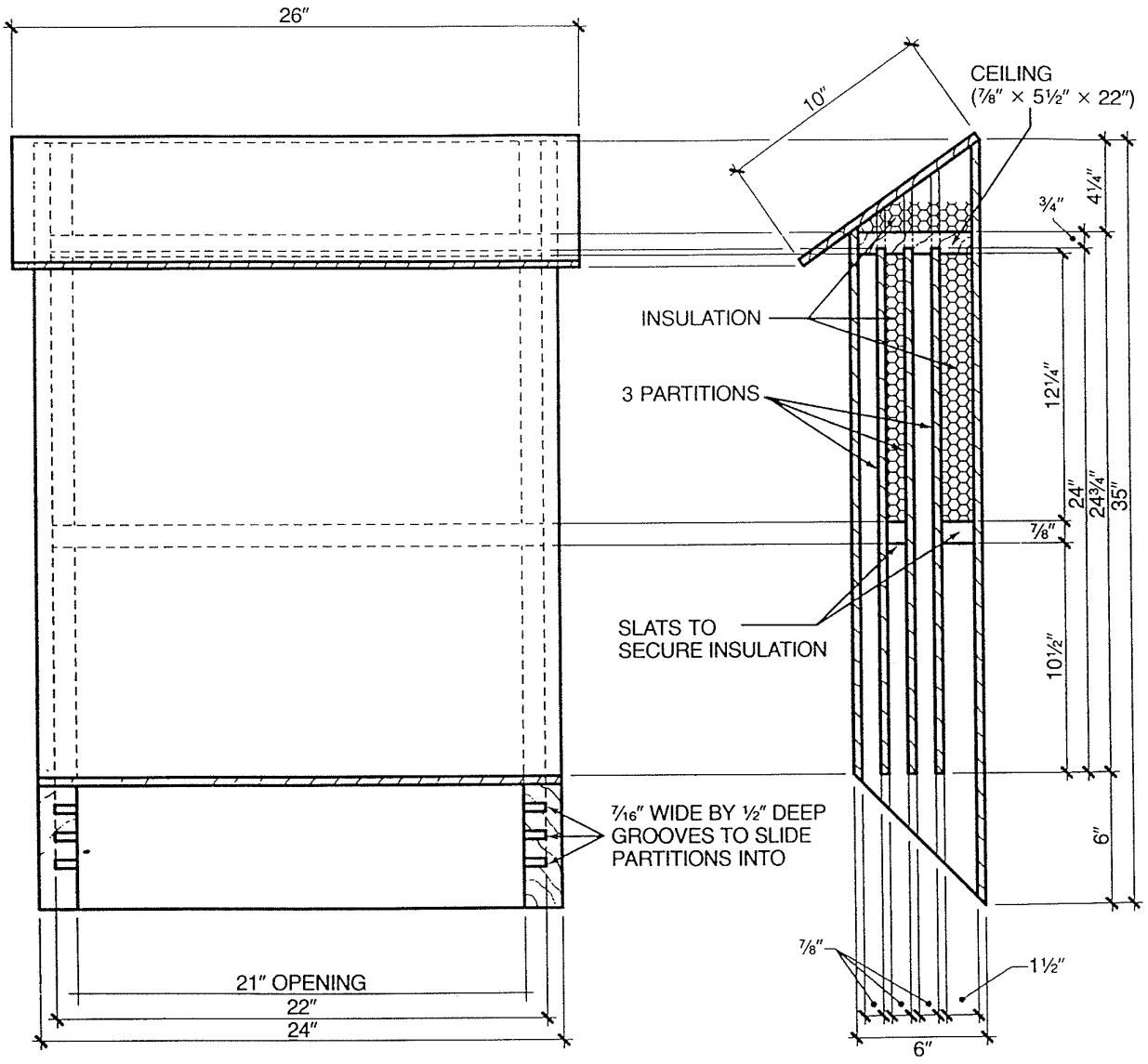
FIGURE 2—SMALL NURSERY HOUSE

Fig. 2 (Cont.)




*** CAUTION: Do NOT use metal window screening**

BAT HOUSE PLANS AND DRAWINGS MADE POSSIBLE BY A GENEROUS DONATION FROM MOTOROLA, INC.
ARTWORK BY GLEN SCHNEIDER AND PATRICIA HARVEY

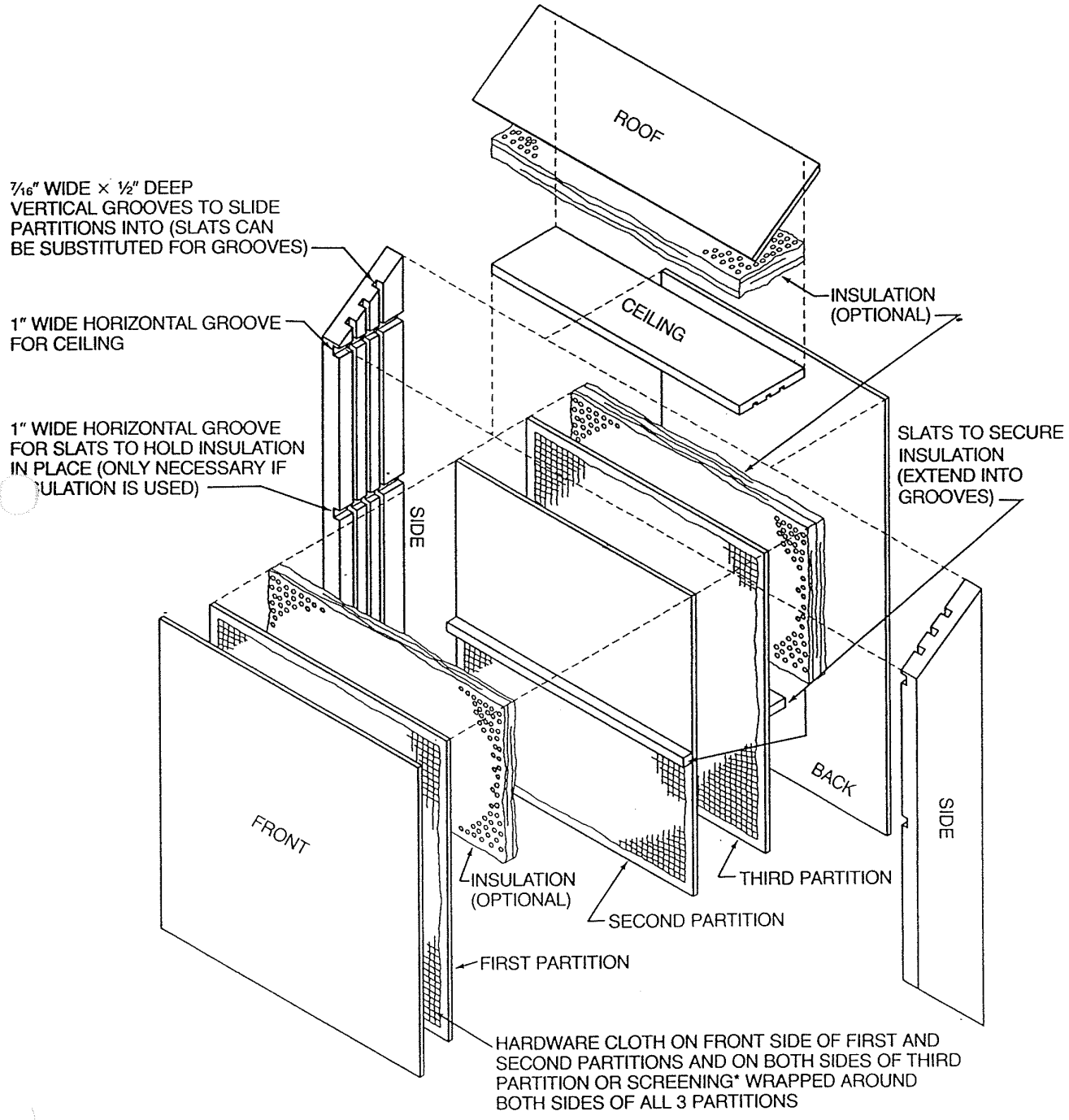



**Materials needed:**
One 6′ piece of 2″ × 6″ lumber (sides)
One 22″ piece of 1″ × 6″ lumber (ceiling)
One 4′ × 8′ piece ⅜″ T-111 no-groove exterior plywood (front, back, three partitions, roof)
Four 22″ × 24″ pieces ¼″ hardware cloth or three 22″ × 49″ pieces fiberglass window screening* (screening is easier to apply if wrapped around both sides of each partition)

**Optional:**
One 2′ piece of 1″ × 4″ lumber (slats to secure insulation; one 1½″ × ⅞″ × 22″ piece and one ⅞″ × ⅞″ × 22″ piece)
Two 24½″ × 21″ pieces Reflextix insulation, folded double (for upper ends of chambers)
One 21″ × 11½″ piece Reflextix insulation, folded double (for attic)

FIGURE 3—LARGE NURSERY HOUSE

Fig. 3 (cont.)

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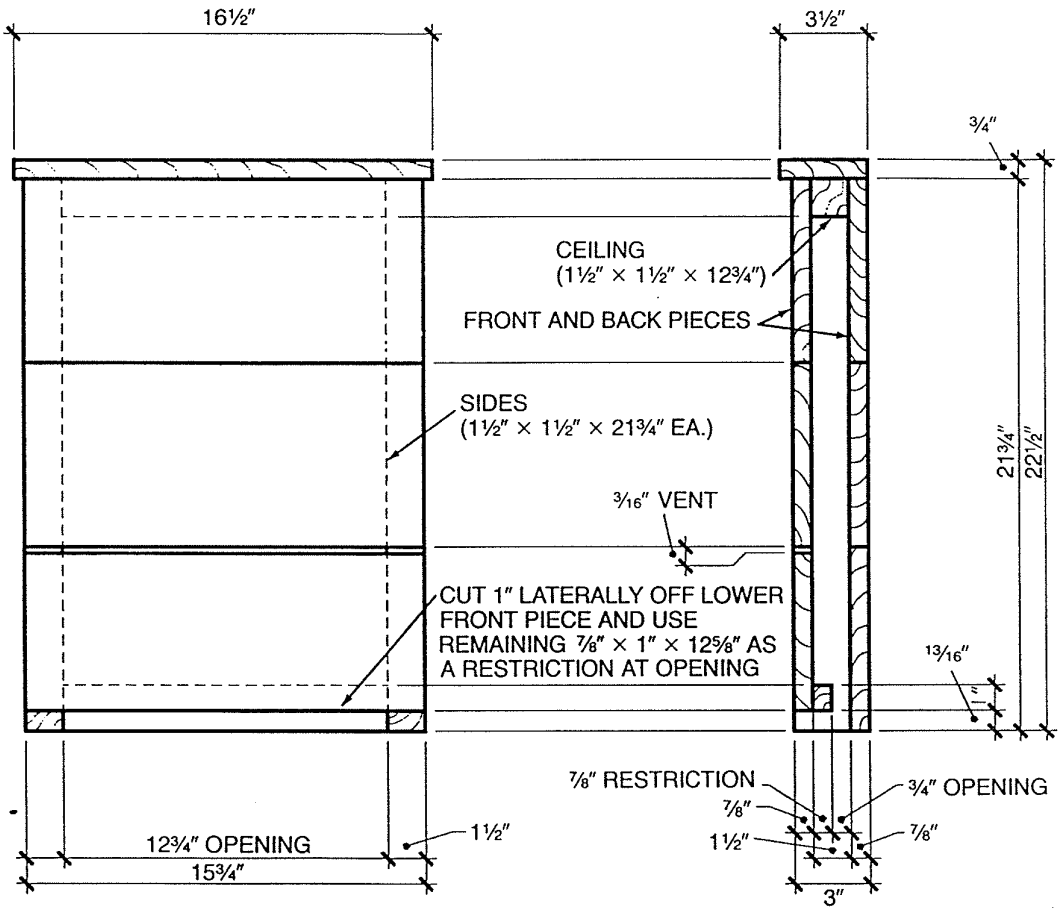
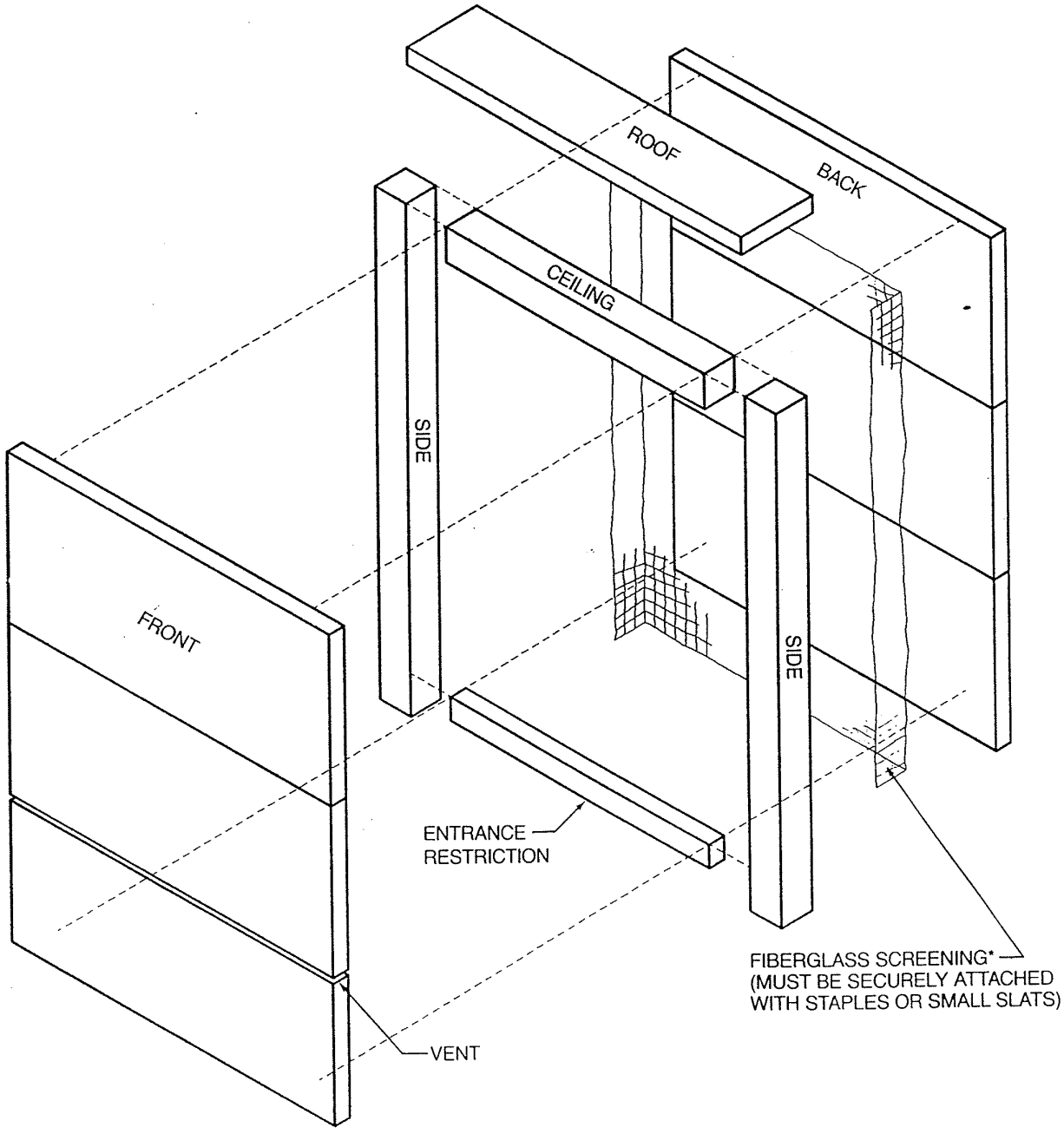



**Materials needed:**
One 8′ piece of 1″ × 8″ lumber (front and back pieces, and entry restriction)
One 5′ piece of 2″ × 2″ lumber (sides and ceiling)
One 16½″ piece of 1″ × 4″ lumber (roof)
One piece 15½″ × 23″ fiberglass window screening*

FIGURE 4—BEGINNER'S BAT HOUSE

Fig 4 (cont.)






* **CAUTION: Do NOT use metal window screening**